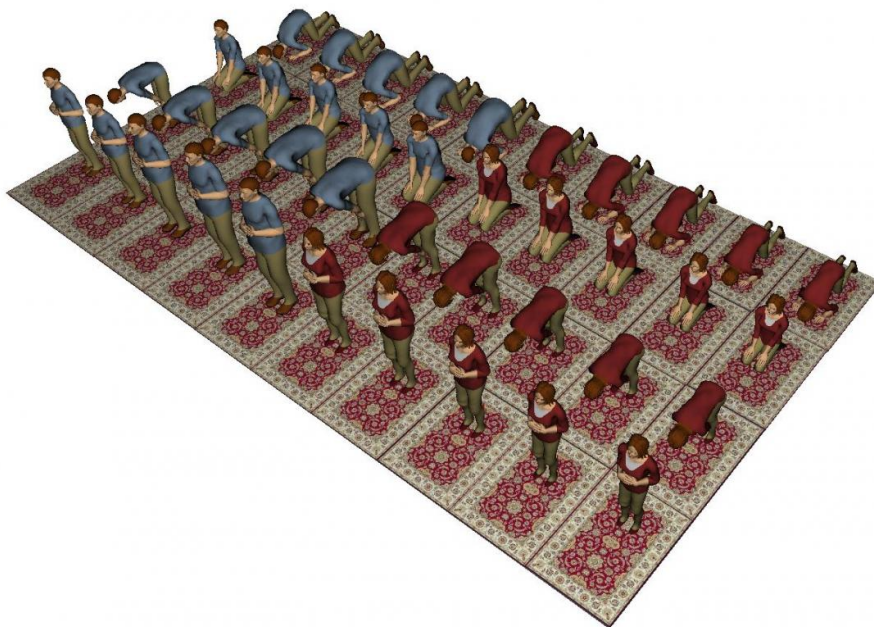


Proper movements in Muslim prayer ritual can reduce lower back pain

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According to research at Binghamton University, State University of New York, the complex physical movements of the Islamic prayer ritual, the Salat, can reduce lower back pain if performed regularly and properly. Credit: Mohammad Khasawneh

Five times a day, roughly 1.6 billion Muslims worldwide, bow, kneel, and place their foreheads to the ground in the direction of the holy city

of Mecca, Saudi Arabia, as part of the Islamic prayer ritual, the Salat. The ritual is one of the five obligatory elements of the faith set forth by the holy book, the Qur'an.

According to research at Binghamton University, State University of New York, the complex physical movements of the ritual can reduce [lower back pain](#) if performed regularly and properly.

"One way to think about the movements is that they are similar to those of yoga or physical therapy intervention exercises used to treat [low back pain](#)," said Professor and Systems Science and Industrial Engineering Department Chair Mohammad Khasawneh, who is one of the authors of "An ergonomic study of body motions during Muslim [prayer](#) using digital human modelling."

While the research focused specifically on Islamic prayer practices, similar movements are also found in Christian and Jewish prayer rituals along with yoga and physical therapy.

The paper was published in the latest issue of the *International Journal of Industrial and Systems Engineering*. Working with Khasawneh, an interfaith team of Assistant Professor Faisal Aqlan from the Department of Industrial Engineering at Penn State Behrend, Assistant Professor Abdulaziz Ahmed from the Business Department at the University of Minnesota Crookston, and Performance Improvement Consultant Wen Cao from the Department of Operational Performance Improvement at the Peninsula Regional Medical Center were all co-authors of the paper. All three are alumni of the Industrial and Systems Engineering doctoral program at Binghamton University.

"Physical health is influenced by socio-economic, lifestyle and religious factors. Moreover, studies indicate that there is a strong association between prayer and vigilance about maintaining a physically healthy

lifestyle," said Khasawneh. "Prayer can eliminate physical stress and anxiety, while there is also research that indicates prayer rituals can be considered an effective clinical treatment of neuro-musculoskeletal dysfunction."

Researchers analyzed statistics based on the movements of computer-generated digital human models of healthy Indian, Asian, and American men and women, and models with lower back [pain](#).

The group found that the bowing portion is the most stressful on the lower back, but for individuals with low back pain, using proper knee and back angles during the ritual can reduce pain. The angles are based on individual body shapes.

"The maximum compression forces created during prayer postures is much lower than National Institute for Occupational Safety and Health (NIOSH) safety limits, and the movements can be safely considered a clinical treatment for low back pain, as it requires different movements of the human body on a regular basis," Khasawneh said. "Based on the pain level, a combination of back and knee angles can be identified."

For those with back pain, maintaining exact prayer postures may not be possible. According to Islamic traditions and practices, if individuals cannot stand, they are allowed to pray seated or laying. If they are able to stand, they should maintain correct postures as much as they can.

"The kneeling posture (sujud) increases the elasticity of joints. It is recommended for these individuals to spend more time in the kneeling posture," Khasawneh said.

According to the research team, using incorrect angles and movements can increase pain. The team also suggested that further study is needed for physically handicapped individuals, those with more extreme body

types and women—especially pregnant women—to find the best movements for these groups. The group plans to further validate the findings with physical experiments using sensors and cameras to track the stresses on the individual body parts during the prayer ritual.

More information: *International Journal of Industrial and Systems Engineering*. [DOI: 10.1504/IJISE.2017.081914](https://doi.org/10.1504/IJISE.2017.081914)

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