

## 3D printed X braces soothe your knees

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For those with knee problems, X-Brace, a 3D-printed orthopedic brace jointly developed by engineering company Delsson and Nanyang Technological University (NTU Singapore) in Singapore, will soon be available.

*(Right) Dr. Jeffrey Chu, President and CEO of the Center for Orthopedic Surgery, helps Mdm Teo Lee Lee (left), a patient who has undergone two total knee arthroplasty, to wear an X-Brace. (Image: NTU Singapore)*

The team used 3D printing technology to reduce the weight of traditional exoskeleton knee orthotics, usually constructed of metal, by 30%, thanks to a new design that uses lightweight plastic and auxiliary springs.

Middle brackets are usually prescribed to older patients to reduce the strain on the knee joint and to assist patients who have had knee surgery.

The X-Brace is based on a prototype auxiliary orthopedic device printed by NTU researchers and developed by Singapore-based Delsson and the Singapore Orthopedic Center. The result is a knee brace that weighs about 720g and is 30% lighter than a metal orthopedic brace.

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Chan Wai Lee, an NTU assistant professor who is a senior researcher at the project in the Faculty of Mechanical and Aerospace Engineering, said that 3D modeling was heavily used to validate various design ideas that could lead to weight savings.

Joel Lim, an NTU PhD student on Assistant Professor Chang's team, led the design work in collaboration with Delsson and 3D printed the prototype for actual verification testing.

"Lightweight and strength are essential for this project. First, we analyzed the traditional knee brace and its current bill of materials. We decided to change to a plastic material with an optimized structure. Using stress maps and topology optimization with 3D modeling, we designed new structures and joints that are strong enough to withstand knee flexion and help move in the right direction," Lim said in a statement. It is stated in.

Fabian Ong, executive director of Delsson Singapore, said the X-Brace can be customized from 6kg to 32kg, changing the way doctors and physiotherapists treat and manage different knee conditions.

"X-Brace will revolutionize patient recovery. Lightweight and non-slip, but modular auxiliary loads allow individualized patient recovery. Quantitative to reduce frame wall thickness and profile. NTU's support for providing a rigorous methodology was important to achieving weight savings after several iterations," said Ong.

The collaborative team worked on improving version 7 of the X-Brace, which consists of a lightweight nylon 6 frame designed to support up to 50 kg of bending force around the knee axis. Product development is currently the 9th version.

The X-Brace is expected to hit the market at a price of \$ 782, depending on the configuration required by the user.

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