# Robot therapist hits the spot with athletes

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NTU graduate and creator of Emma, Mr Albert Zhang (top), starting the massage treatment for national athlete Miss Lim Jia Min, Captain of the Singapore National Womens Basketball team. Credit: NTU Singapore

Trials of a prototype robot for sports therapy have just begun in Singapore, to create a high quality and repeatable treatment routine to improve sports recovery, reducing reliance on trained therapists.

The robot named Emma, short for Expert Manipulative Massage Automation, has already treated 50 patients in trials including professional athletes for conditions ranging from tennis elbows, stiff neck and shoulders, to lower back pain.

Emma is a robotic arm that comes with a 3D stereoscopic camera and a custom made 3D-printed massage tip. It uses sensors and diagnostic functions to measure the response of a patient and the stiffness of a particular muscle or tendon. The detailed diagnostics are analysed and uploaded to the cloud so the patient's recovery can be closely monitored over time.

Emma is created by a graduate of Nanyang Technological University, Singapore (NTU Singapore) whose start-up company is incubated by the university.

Emma is currently undergoing user trials at Kin Teck Tong, a modern medical institution with a chain of clinics that offer sports injury rehabilitation and pain management through the integration of advanced sports science and traditional Chinese medicine.

NTU graduate Albert Zhang, the creator of Emma who founded the startup AiTreat to develop and eventually market this innovation, said he wanted to solve some of the challenges faced by sports therapy and pain management clinics, such as a shortage of trained therapists and a need to deliver high quality therapy consistently.

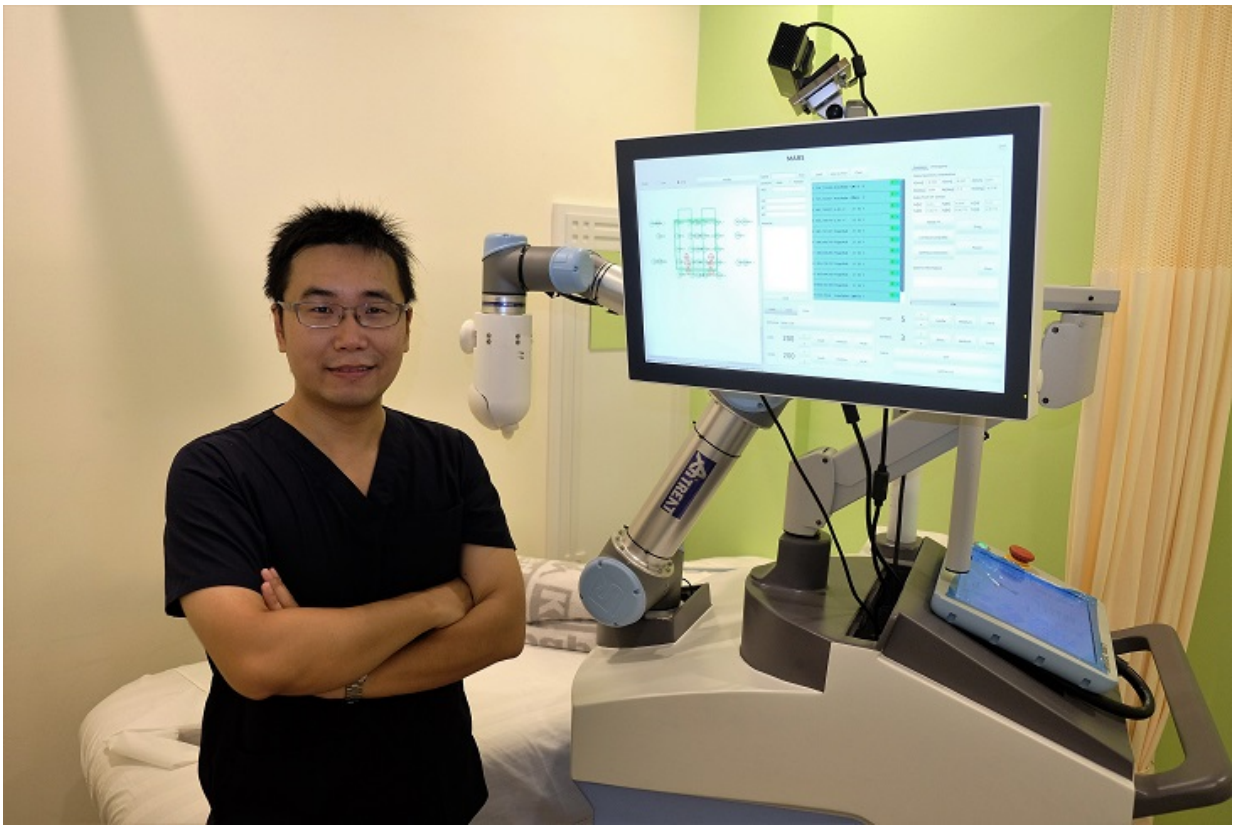
"We have designed Emma as a clinically precise tool that can automatically carry out treatment for patients as prescribed by a physiotherapist or Chinese physician," said Mr Zhang, who graduated in 2010 from NTU's Double Degree programme in Biomedical Sciences and Chinese Medicine.

"This will be one of the first robots out in the market specifically for use by sports therapists and Traditional Chinese Medicine (TCM) physicians. Our aim is not to replace the therapists who are skilled in sports massage and acupoint therapy, but to improve productivity by enabling one therapist to treat multiple patients with the help of our robots."

Emma, which has a user-friendly interface and recommended guidelines for various sports injuries, was designed by Mr Zhang based on his experience of treating sports injury as a licensed TCM physician in Singapore for the past five years.

The robot also has several safety features working in tandem with advanced pressure sensors to ensure the safety and comfort of its patients.

Executive Director of Kin Teck Tong, Ms Coco Zhang, said the new physiotherapy robot has the potential to be a disruptive innovation, especially for the sports science and pain management industry.



Albert Zhang and Emma the robot therapist. Credit: NTU Singapore

"Just like countries such as the United States, Europe, Japan and China, Singapore is also facing a rapidly aging population. Over the next decade, more people are going to suffer from physical ailments such as arthritis and will be seeking treatment," Ms Zhang said.

"Since the younger generation prefer knowledge-based jobs rather than physically intensive jobs such as massage therapists, there will likely be a shortage of trained therapists in future. In our trials with the robot, the experience has been very good, as it can perform most treatments as well as our therapists."

# Physiotherapy meets the Cloud

Emma is equipped with sensors and diagnostic functions with detailed diagnostics sent to the cloud for analysis and generation of performance reports of the patient's progress. With Emma, patients can accurately measure their recovery using precise empirical data.

This is valuable for athletes as their injuries, treatment and recovery can now be measured and monitored by their physician and therapists. In addition, the treatment programmes can be adjusted based on the progress of the patients' recovery.

Mr Zhang and his teammates won the Microsoft Developer Day Start-up Challenge earlier this year and the propriety cloud intelligence used by Emma is supported by Microsoft.

After the clinical trials are completed, a second-generation robot will be developed that is more compact and mobile.

Chief Executive Officer of NTUitive, the innovation arm of NTU, Dr Lim Jui said disruptive innovations like Emma are what the university hopes to achieve by nurturing an entrepreneurial and innovative culture among its students, graduates and professors.

"We are happy to support one of NTU's promising graduates and to turn his dream into reality that will benefit society," Dr Lim said. "We hope to encourage more of our students to follow Albert's footsteps, daring to dream and willing to plunge into uncharted waters to develop future solutions to benefit Singapore and the world."

Provided by Nanyang Technological University