

## **National Taiwan Normal University 【April 27 Newsletters】**

**NTNU Precision Sports Science Supporting top athletes to achieve excellence.**

**We develop holistic gymnastics education and innovative physical education modules to be introduced to primary and secondary schools around the country.**

Combining technology with sports is critical for athletes to break through and leap forward. The National Taiwan Normal University (NTNU) employs technology to assist gymnastics, supporting top athletes to enhance performance in international competitions.

NTNU has established the NTNU gymnastics team and NTNU Junior Gymnastics Club to nurture more young athletes by using the student's after-school hours to develop an innovative physical education module for learning gymnastics through games. NTNU is looking forward to more international competitions in the future.

### **Gymnastics- The best physical education.**

Gymnastics is a comprehensive sport that requires whole the body's movements such as rolling, tumbling, leaping, jumping, and equipment movements, promoting muscle development and nervous system integration. It has been scientifically proven that gymnastics can improve children's sensory integration system and cognitive coordination. Through proper gymnastics exercises, children can build self-confidence, effectively integrate their body senses and enhance their coordination skills.

Although the general public's perception of "gymnastics" is that it is a challenging sport to get started. However, by providing systematic training through sports science, NTNU has developed a gymnastics curriculum supporting students with a lower threshold, thereby establishing the correct training concepts and enhancing learning efficiency.

NTNU is also actively researching and developing a science-based gymnastics program in early childhood and elementary schools to cultivate children's gymnastics skills early to achieve healthy athletes of the future. The (NTNU Junior Gymnastics Club) team integrates sports science into regular training (e.g., inertial resistance training, vibration training, enhanced activity, and monitoring by sensor technology) to effectively improve athletes' agility, speed, balance, endurance, air sense, explosive power, muscular neurological response, and other comprehensive skills to help athletes reduce sports injuries while improving athletic performance.

### **NTNU Gymnastics Sports Science Team**

Taiwan gymnastics champion "King of Cats" Tang Chia-Hung took seventh place in the gymnastics all-around competition of the 2021 Tokyo Olympics (scoring 84.798), where the all-around gymnastics competition created a new history for Taiwan gymnastics. Tang Chia-Hung's indomitable spirit is truly inspiring. He has experienced many misdirected training sessions and serious sports injuries along the way and was in so much pain that he almost wanted to give up. In 2015, he joined the NTNU Gymnastics Team. He was fortunate enough to receive systematic training from Prof. Shi-Hang Weng. With the precise analysis and guidance of sports science, he officially started his first step in training top athletes.

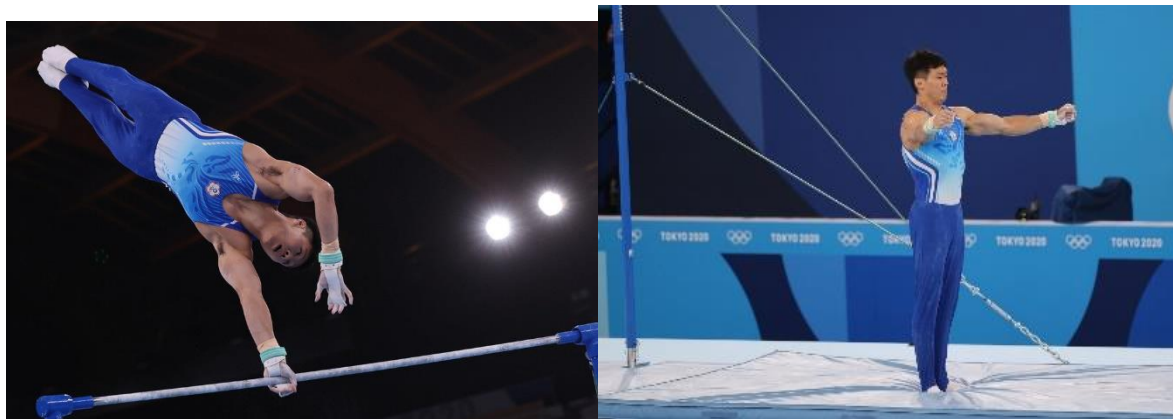
Tang Chia-Hung, who has been training at NTNU for a long time, has achieved remarkable results because of his hard work with the support of the NTNU sports science team. The team includes Prof. Tzyy-Yuang Shiang, Prof. Li-Kang Chi, Prof. Tsung-Min Hong, Prof. Mei-Yen Chen, gymnastics coach Shi-Hang Weng, track and field coach Yu-Ru Cai, and Mr. Jen-Yu Ho, the current Director of the Sports Science Division of the National Training Center, is invited to support the training at the NTNU Department of Athletics performance.

Mr. Tzyy-Yuang Shiang, Chair Professor of Athletics Performance at NTNU, is the Chairperson of the Sports Science Division of the National Training Center. Sports Science focuses on supporting the development and training of athletes through various sports science tests and evaluations,

assisting athletes in reducing sports injuries and improving athletic performance, and providing psychological counseling and nutritional planning for athletes.

During the Olympic Games, Prof. Shi-Hang Weng and Prof. Tzyy-Yuang Shiang's sports science team analyzed Tang Chia-Hung's force state and tumbling landing techniques. They used the inertia sensor to collect the waist and feet acceleration and angular data to evaluate the centrifugal force and the impact of the landing technique to further identify the critical factors for a perfect landing.

Through the data analyzed by the sports science team and combined with Professor Shi-Hang Weng's inertial resistance training on lower limb stability and neuromuscular activation analysis, Tang Chia-Hung clearly increased two advantages: i. Improved landing stability (36.3% perfect landing in 2019; 72.7% perfect landing in 2021; 36.4% improvement); ii. The highest E-score (53.198) and the lowest deduction for all athletes.



### **Innovative teaching modules for elementary and junior high school gymnastics**

Nowadays, gymnastics is rarely included in the curriculum of elementary and middle school physical education classes. With the introduction of the Curriculum Guidelines of 12-Year Basic Education, emphasis is placed on cultivating students' competencies. Director Chun-Chen Chan of the Center for Physical Education Research and Development and Assistant Professor Ching-Wei Chang of the Department of Physical Education and Sports Science at National Taiwan Normal

University was commissioned by the (National) Department of Physical Education, Ministry of Education. Since 2016, they have been developing and promoting PE teaching modules in a significant modular and modularized way according to different types of sports teaching materials, with "easy for teachers to use and easy for students to learn" as the primary demand of the module videos.

Associate Professor Deng-Yau Shy and teacher Chi-Chang of the Department of Physical Education and Sports Science developed a gymnastics game teaching module using "GBODY" (G: Game Exploration, B: Movement Challenge, O: Cyclic Exercise, D: Group Discussion, Y: Sharing and Appreciation) as the core framework for design. In 2018-2020, we developed six teaching modules for the lower and upper-intermediate levels. The modules allow students to learn the basic movements of gymnastics through storytelling and games to reduce their stress and fear of the standard gymnastics movements and enhance their motivation.

Currently, there are 14 counties and cities gymnastics counseling groups that are using this module to cultivate gymnastics educators. We expect the seeds of gymnastics education to sprout, roots in, and thrive in all counties and cities throughout Taiwan, thus achieving the educational philosophy of "spontaneity, interaction, and reciprocity".

### **NTNU Junior Gymnastics Club gymnastics cultivation program**

The development of top athletes starts at a young age, and it takes many difficulties to nurture them in a planned way. Professor Shi-Hang Weng established the NTNU Junior Gymnastics Club gymnastics team in 2013. With the support of the university and the Athletic Department, the team has been able to achieve remarkable results in domestic competitions (89 gold, 68 silver, and 43 bronze medals since its inception).

In 2017, we officially established NTNU (Promotion) Gymnastics Club to popularize and promote gymnastics on campus. With the concerted efforts of the first president and administrators, NTNU felt the increasing atmosphere in participating in the gymnastics on campus. In 2018, we

established NTNU Junior Gymnastics Club to officially open the enrollment channel for gymnastics promotion and expansion.

Until now, through the NTNU Junior Gymnastics Club team, (promotion) Gymnastics Club, College of Sports & Recreation Gymnastics Team, and Gymnastics Club, we have gradually formed and established the NTNU Junior Gymnastics Club Gymnastics Seedling Cultivation Program. We believe that NTNU's support in sports science combined with future character education and practical training cultivates the next generation into "tomorrow's champions" with excellent characters and academic excellence.



### **NTNU holistic gymnastics education development demands**

Although the popularization of gymnastics and the promotion of this physical education module has become a trend, NTNU's gymnastic popularization at all levels still depends on the collaborative initiative of the central and local governments; specific policy demands from the NTNU sports team, and the Think Tank Office are as follows: 1. integrate module teaching into the school's overall curriculum plan; 2. organize competitions for gymnastics teaching and observation in conjunction with curriculum; 3. establish a talent cultivation system to assist learning clubs, incubator boot camps, or representative teams interested in participating in learning advanced level of gymnastics. With the support of the above policies, we expect NTNU to consistently implement research, education, and activities to meet the demands of holistic gymnastics education.



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