

## SPORT SCIENCES RESEARCH PROJECTS IN SYDNEY

The Games of the XXVII Olympiad in Sydney saw the inauguration of the Pfizer/IOC Olympic Research on Sport Sciences. This research partnership between Pfizer and the IOC Medical Commission projects has two major purposes:

- to protect the athletes from excessive forces
- to enhance performance using improved understanding of the functioning of the athlete's body.

These kinds of biomechanics research projects started at the Games of the XXIII Olympiad in Los Angeles in 1984. The projects are planned, organized and executed as a cooperation of the IOC Medical Commission, the corresponding International Federation and a selected research team.

The research projects for the Games in Sydney were selected through a thorough scientific selection procedure. A call for research project proposals was conducted in relevant scientific journals and on the web. A total of 43 project proposals were received for consideration. They were submitted by scientists from 15 countries and concentrated on 17 different sports. A scientific review committee co-chaired by Richard Nelson and Bruce Elliott reviewed the submissions. The evaluation was guided by the following criteria: (a) quality of the science, (b) applicability of the findings to Olympic athletes, (c) applicability of the findings to athletes of all ages and abilities in general and (d) the need to collect the data during the Olympic Games. Nine project proposals were accepted, seven for projects during the Olympic Games and two for projects related to the Olympic Games with data collection before the Games.

by Bruce Elliott\*



### Pre-Olympic Projects

- (1) *Morphological Correlates of Equipment Set-Up and Performance Among Olympic Kayak Paddlers, Canoeists and Rowers* (Tim Ackland, University of Western Australia, Australia)

Kinanthropometric measures were taken from participating Olympic athletes in rowing, canoeing and kayaking, prior to the start of the Olympic Games, to study the relationship between body measures and performance.



Australian Patrick Rafter serving.

The project had wide support and the majority of athletes and national federations participated. The participating athletes were given their results during the Olympic Games. The kinanthropometric measures along with each individual boat set-up and the Olympic performance of the above athletes will be analyzed and studied following the Olympic Games.

- (2) *Monitoring and Evaluation of Training and Performance of Canadian Olympic Swimmers* (David Smith, University of Calgary, Canada).

The purpose of this project was to follow potential Olympic athletes in swimming during the preparation phases for the selection trials and the Olympic Games. A number of Canadian swimmers were tested, primarily with respect to their blood biochemistry. The data is being analyzed to understand the potential factors responsible for appropriate preparation of high performance swimmers.

### Olympic Projects

- (3) *Factors Contributing to Gymnastics Landing Performance During Olympic Competition* (Jill McNitt-Gray, University of Southern California, United States of America)

The purpose of this project was to identify factors related to landing performance and to determine factors responsible for high landing forces in gymnastics. Gymnasts were filmed during the floor exercises, the vault and landing from the high bar.

The information will be analyzed in order to potentially improve the floor surfaces so that they absorb more energy and reduce the chance of injury as well as to provide gymnasts of all levels with infor-

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Viewpoint for the study of tennis serves.

mation regarding why they either hit or missed their landing. The aim is to help gymnasts continue to raise the level of competition in a safer environment.

(4) *Release Mechanics for High Bar Dismounts* (Fred Yeadon, Loughborough University, Great Britain)

The purpose of this project was to identify factors related to performance and responsible for high forces during high bar (male) and uneven bar (female) performances. Gymnasts were filmed to study release and re-grasp techniques. The information gathered will be analyzed after the Olympic Games.

(5) *Techniques Used in Performing the Handspring-Double Forward Tucked Vault* (Yoshi Takei, Southern Illinois University, United States of America)

The purpose of this project was to identify factors relevant for teaching this element and responsible for excellent performance. Male gymnast vaulters were filmed performing the above vault. The information gathered will be analyzed after the Olympic Games.

(6) *Fatigue and Implications to Shoulder Injury in the Tennis Serve* (Glenn Fleisig, Birmingham Sports Medicine Clinic, United States of America)

Aiming to provide insight into the cumulative effects of fatigue during repetitive, stressful overhead activity, the purpose of this project was to determine shoulder forces during the tennis serve and relate the results to possible fatigue and injury.

Players were filmed, where possible over multiple matches, so that joint loading at the shoulder could be calcu-

lated. Comparisons will be made (a) over a match, (b) between 1<sup>st</sup> and 2<sup>nd</sup> serves, (c) between repeated matches, (d) between different speeds (e) for selected service styles. Computer software will be used to reconstruct the mechanics of the shoulder and help to analyze the data collected from the high-speed cameras. Once the information has been analyzed, the findings hope to help with training and rehabilitation for tennis players of all levels. The ultimate goal is to help players to serve safely but efficiently and effectively, without compromising performance.

(7) *Competition Swimming Analysis at the Sydney Olympic Games* (Bruce Mason, Australian Institute of Sport, Australia)

This project had two components, a service and a research component. The



*The sprint, being studied for scientific projects.*

service component consisted of data on stroke rate and length, velocity, start, turn and times for selected sections of the races that were provided to coaches shortly after the heats/semi-finals and finals so that they could analyze the performance of all the competitors. The research part consists of further analysis of the data with respect to (a) consistency of performance over heats/semis and finals, (b) tactical changes over the heats/semis and finals, (c) performance variations caused by “new swim suits” and (d) identification of performance indicators.

(8) *Kinematics and Kinetics in Pole-Vaulting: Energy Storage and Energy Return* (Peter Brüggemann, German Sports University, Cologne, Germany)

The purpose of this project was to improve vaulting technique, while at the same time reducing the potential for lower back injuries.

All male and female pole-vault finalists

were filmed in this project. The kinematic data collected at the Olympics will be combined with force data previously collected to determine internal loading.

(9) *Energy Produced and Lost on Sprinting Performance* (Darren Stefanyshyn, University of Calgary, Canada)

The purpose of this project was to determine the influence of shoe sole stiffness on running performance. All male and female 100m sprint races were filmed. Data on the movement characteristics of the foot and leg will be combined with data previously collected to modify the design of running shoes to improve efficiency and performance.

If compared to previous biomechanics studies undertaken at the Olympic Games, the selected projects for the Sydney Games had a new aspect. For three of the nine projects chosen, the Olympic data collection was just one component of a larger project. This

combination of laboratory and field data allows for a better study design and relevant findings are, hopefully, more likely. Future Olympic projects are encouraged to move in this direction.

In conjunction with the actual research projects, three newsletters were produced and distributed during the Games to promote the Pfizer/IOC Medical Commission’s sport sciences activities, specifically the IOC Olympic Prize and the research projects. Additionally, four media conferences (IOC Olympic Prize, Pfizer/IOC Research, Swimming, and Sprinting and Pole Vault) were held during the Sydney Olympic Games. They resulted in numerous newspaper reports and television interviews publicizing the value of science in athletic performance.

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