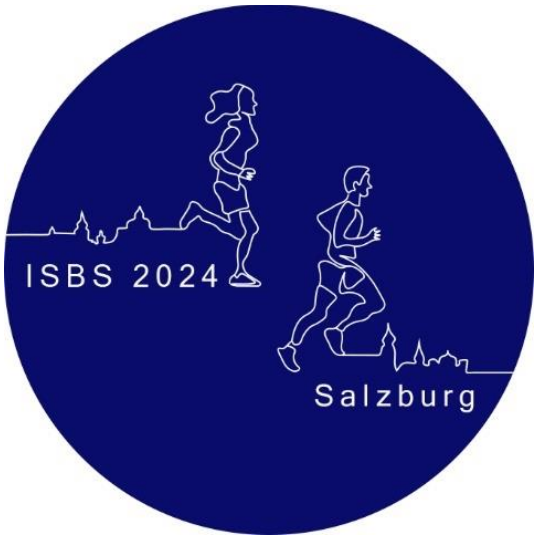
ISBS 2024 Conference Proceedings

42nd Conference of the International Society of Biomechanics in Sports



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42nd Conference of the International Society of Biomechanics in Sports Conference, Salzburg, Austria July 15-19, 2024

Volume 42 Issue 1

Editors:
Jana Holder (University of Salzburg)
Isabella Fessl (University of Salzburg)
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Each paper in these proceedings has been reviewed by at least two members of the scientific committee. The scientific committee comprises the current members of the board of directors of the ISBS and the keynote speakers for the upcoming conference.

The correct format for citations as per APA style guidelines for the Sports Biomechanics journal (http://www.tandf.co.uk/journals/authors/style/reference/tf_APA.pdf) is as follows:

> Author, A. A. (Year). Title of article. Title of the Journal, Volume(Issue), pp-pp. Retrieved from WEBSITE A sample citation using the 2014

The correct format for citations of the Dyson lecture is follows:

> Harrison, A. J. (2014, July). Applications of Functional Data Analysis in Sport Biomechanics. In K. Sato, W. A. Sands, & S. Mizuguchi (Eds.), Proceedings of the 32nd International Conference of Biomechanics in Sports. (pp. 1-9). Konstanz, Germany: International Society of Biomechanics in Sports. Retrieved from https://ojs.ub.uni-konstanz.de/cpa/article/view/5905/5390

The International Society of Biomechanics in Sports

Primary Purposes

To provide a forum for the exchange of ideas for sports biomechanics researchers, coaches, and teachers.

To bridge the gap between researchers and practitioners.

To gather and disseminate information and materials on biomechanics in sports.

Members

The International Society of Biomechanics in Sports (ISBS) is composed of members from all over the world who share a common desire to study and understand human movement, especially as it relates to sports biomechanics. Members come from a wide range of backgrounds e.g., exercise science, education, engineering, computer science, rehabilitation, and medicine.

Annual Conference

The first full scale conference of the International Society of Biomechanics in Sports was held June 20-25, 1982, in San Diego, California, with 123 participants. The Annual Conference of the ISBS is conducted in an atmosphere that favors and encourages wide participation, and the general collegiality and congeniality are dear to its members. The research presented and materials produced are at the cutting edge of knowledge and technology of the field. In addition to oral and poster research presentations select sport science topics are covered in depth each year through special lectures. A special feature includes the Geoffrey H.G. Dyson lecture, which is presented by an outstanding individual who has demonstrated livelong excellence in the field of sports biomechanics. Other presentations are given by the winners of the New Investigator Award and the Hans Gros Emerging Researcher Award.

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Award Lectures

Geoffrey Dyson Award – Jacqueline Alderson (The University of Western Australia)

Biomechanics in the age of AI: Navigating a discipline at a crossroad

The AI rush promises to 'transform' discovery and productivity. But who and what does AI serve, and how does it rearchitect fundamentals of science and practice – especially for the sports biomechanist? Drawing on a career at the frontier of tech and data-informed innovation, this presentation critically examines the stakes and opportunities of a rapidly evolving technology ecosystem and the challenges it presents for the future of biomechanics.

Hans Gros Emerging Researcher Award – Natsuki Sado (University of Tsukuba)

Biomechanical inter-relationships between physical and motor features in maximal effort locomotion

To extract motor potential, humans enhance motor and physical inter-relationships, but movement analysis and physical measurements are performed independently. I aim to bridge the gap in their understanding and establish a biomechanical knowledge base that represents individually optimized strategies with different bodies to extract motor potential.

Humans extract motor potential by enhancing motor and physical inter-relationships, but these have often been studied independently. I aim to bridge this gap and establish a biomechanical knowledge base for individual motor strategies in maximal-effort locomotion. In Project 1, I quantified segmental contributions to effective energy for CoM movement in jumping, sprinting, and cutting. In running jumps, non-extension movements induce more than half of effective energy. These mechanisms usage human-specific morphology and are common across different locomotion modes. These findings inspired my interest in inter-individual variability in motor and physical features. Project 2 focuses on inter-individual variability and plasticity in physical properties. Besides muscle morphology/function, I examine properties passively related to motion, such as inertial and tendon properties, as potential determinants of motor solutions. In Project 3, I am conducting studies combining physical and motion analyses to understand desired physical-motor relationships and determinants of individually optimized motor solutions.

Keynote Lectures

Hans-Christer Holmberg (Luleå University of Technology)

Integrative Biomechanics and Physiology - Research Meets Practice.

This presentation explores the synergy between biomechanics and physiology to optimize sports performance. Based on research in Olympic sports, it shows how their integration guides practical strategies for elite athletes, translating science into action for real-world results at an international level.

Silvio Lorenzetti (Zurich University of Applied Sciences)

Optimizing Strength Training: Computational and experimental methods, and accessible technology

Emphasizing musculoskeletal modeling, internal load conditions, and in-vivo validation, the focus transitions to velocity-based training, presenting recent advances in mobile sensing and data analysis. In the future, these methods, accessible to a broad population, allow for widespread study of the training-adaptation relationship.

Sophia Nimphius (Edith Cowan University)

The Paradox of “Perfect” Performance: Where does adaptable fit in our research conclusions?

In this presentation, I will critically assess conclusions from biomechanics research, specifically focusing on potential misinterpretations when applied in practical settings. The implications of these interpretations, both for future research and practitioner approaches, will be thoroughly examined. As a theme during the discussion, the mechanisms of injury and the proposed methods of therefore reducing ACL injury as concluded by research will be considered. The prevailing inclination to coach towards "perfect movement" will be evaluated, highlighting potential oversights in how we interpret the outcome measured during an athletic movement as synonymous with the process required to become an “adaptable athlete”.

Veit Senner (Technical University of Munich)

Engineering Issues in Sports Biomechanics: Towards Smart Sport Equipment and Materials

3D-printing technologies, wearable sensors, powerful processors and machine learning offer great opportunities for innovative products, not only for sports, but also for robotics, ambient living or rehabilitation. Showing examples of our research the close cooperation between engineering, sports- and health science is illustrated.

Darren Stefanyshyn (University of Calgary)

Individualization of Sporting Equipment

Recent research has suggested that matching equipment, be it footwear, apparel, hockey sticks, golf clubs, etc. to an individual athlete based on their biomechanics, discreet movement patterns, forces generated, and control strategies is important to maximize their performance and minimize their risk of injury.

Benedicte Vanwanseele (KU Leuven)

How can musculoskeletal modelling contribute to understanding self-optimization in running?

Each runner runs with their own preferred running style including a self-selected speed, stride frequency and foot strike pattern. This preferred running style adopted by runners is metabolically optimal for them. Hence, energy minimization is often assumed to be one of the major neuromuscular mechanisms underlying the preferred gait. I will address in this talk how musculoskeletal modelling can contribute to a better understanding of the mechanisms behind this optimal running style.

Scientific Program

Over 260 papers were accepted into this year's proceedings. The program included 28 oral sessions and 8 poster sessions. Conference papers covered the following topics:

- Athletics
- Ball & Team Sports
- Clinical Biomechanics
- Evaluation Methods
- Injury & Rehabilitation
- Machine Learning
- Markerless Methods & VR
- Modelling
- Simulation
- Motor Control
- Muscle & Tendon
- Paralympics
- Running
- Sprinting
- Stick/club/racquet sports
- Strength & Conditioning
- Teaching & Coaching
- Water Sports
- Wearables
- Women

Applied Program

The applied program for this year's conference included sessions on the following topics:

- Cycling with Qualisys
- Return-to-Sport with Qualisys
- Powerlifting
- Breathing Pattern Biomechanics in Sport
- From Lab to Field: Prototypes in Sports Sensor Tech
- Gymnastics and Acrobatic Sports: Coaching Biomechanics and Motor Control Interface
- Teaching Biomechanics

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Acknowledgements

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