Research Methods in Sports Science for Interdisciplinary Approaches

International Summer School 20th – 26th of Aug, 2023
German Sport University Cologne

Deutsche Sporthochschule Köln
German Sport University Cologne

Workshops

in alphabetical order of tutors, all confirmed – NB each timeslot for workshops is 2.5 hours.

Movement and reflection: the hermeneutics of sport

1

Dr. Tobias Arenz (Institute of Pedagogy and Philosophy)

2 Timeslots: Fri 25 Aug, 10.15 am – 12.45 pm, 03.15 pm – 05.45 pm

Location: SR 93, NawiMedi (Entrance A, 1st floor)

Remarks: Limited to 20 participants.

Abstract: *The aim of the workshop is to adopt a broadly cultural studies perspective on movement and sport and to introduce and jointly practice some characteristics of this perspective. A central assumption of a cultural studies perspective is to understand human movements and sports practices as the production of supra-individual meaning. Hermeneutics in this context is the name for the methodical procedure of understanding meaning, which initially refers to the interpretation of textually composed meaning. We will explore the form of this procedure in a double search movement: on the one hand, we will get to know hermeneutics as a differentiated procedure in the field of social sciences. On the other hand, we will methodologically reflect on hermeneutics in the context of the philosophy of sport. In doing so, we will deal with central concepts (e.g., prototypes) and discuss the question in how far hermeneutics of sport has consequences for the general understanding of hermeneutics.*

The overall aim of the workshop is to answer the question of how to read movement and sport, i.e., production of meanings that do not primarily take place in the medium of language. In the sense of a challenge, we will have to work on the text Production of Presence of Hans Ulrich Gumbrecht, who does not consider movement and sport to be hermeneutically accessible. Thus, it seems to be an open question whether and how one can speak of hermeneutics of sport in a meaningful way.

Sportslaw: interpretation and evaluation of sport rules

2

Dr. Caroline Bechtel (Institute of Sport Law)

1 Timeslot: Mon 21 Aug, 03.15 pm – 05.45 pm

Location: SR 93, NawiMedi (Entrance A, 1st floor)

Abstract: *Laws and rules being the primary legal tool, their application is subject to interpretation and also increasingly to evaluation. An evaluation in the field of sportslaw aims at measuring the Athlete´s understanding of sport rules and their adherence to those rules in order to make assertions as to the effectiveness of the relevant rules and regulations. Within the workshop, we will apply the evaluation methods presented in the lecture. To this end, we will take a closer look at anti-doping-codes, anti-manipulation-codes, regulations in the field of safe sport and other sports-related rules. In accordance with the Institute´s interdisciplinary approach, sport science methods like an Athletes' survey – with a special focus on the questioning technique – or the analysis of data and statistics will also be addressed.*

Mobility, Cognition and Virtual Reality

3

Professor Dr. Otmar Bock (Institute of Exercise Training and Sport Informatics)
Professor Dr. Klara Brixius (Institute of Cardiology and Sports Medicine)
Professor Dr. Wiebren Zijlstra (Institute of Movement and Sport Gerontology)

1 Timeslot: Thu 24 Aug, 10.15 am – 12.45 pm

Locations: Gym/Sports hall no. 10
Laboratory Sport Gerontology, Institute Building V (IG V)

Remarks: Limited to 15-20 participants.

Abstract: *In this workshop, research projects will be presented which focus on virtual scenarios which can be used to analyse mobility and cognition or to improve mobility in older people. After a short theoretic introduction, participants will have the opportunity to participate in the different settings to get further insight into the methodological approaches of virtual reality in movement science. Finally, a concluding discussion is planned on future perspectives and possible collaborations.*

1. Setting: The Structure of Wayfinding Strategies in Young and Old people
(Professor Dr. Otmar Bock)

This contribution will present how we use virtual reality to investigate different strategies for human wayfinding. Participants will have the opportunity to observe and experience the software to gain a further understanding of the methodological approach of virtual reality in studying the human's complex cognitive skills. In the end, we will discuss possible future applications and potential collaboration directions.

2. Setting: Experimental setting of balance-related performances integrating inhibitory control
(Eunyoung Kwag M.A., Dr. Kyungwan Kim, Dr. Igor Komnik, Professor Dr. Wiebren Zijlstra)

Age-related attenuation of inhibitory control (IC) is associated with reduced gait adaptability, balance recovery and increased fall risk. However, as IC has primarily been assessed by using upper extremity tasks (e.g., Stop signal tasks), it is unclear how IC may affect balance performance. Since motor inhibition, i.e. suppressing an incorrect motor action, seems essential for successful balance performance, we designed a gait initiation task that allows to study the effects of IC on anticipatory postural adjustments (APA's). Standing subjects were instructed to initiate gait promptly, when a traffic light on a large computer screen turned from red to green (Go), and to keep standing upright at the starting point, when the signal changed from green to red (Stop). During the setting this experimental setup will be presented and future applications will be discussed.

3. Setting: (VR-)Exergaming in a rotating instable plank position: implication for treatment of low back pain
(Daniel Sieger B.A., Professor Dr. Klara Brixius)

Virtual reality applications have been shown to be very effective in pain registration and may improve movement. In this part of the workshop, we will present a setup which is used to avoid chronic pain situation in patients with acute low back pain. Possibilities and limitations of virtual applications in this setting will be presented and discussed.

4. Setting: Age-related changes in task switching in voluntary gait adaptability
(Dr. Kyungwan Kim, Professor Dr. Wiebren Zijlstra)

We recently developed a novel voluntary gait adaptability (VGA) task requiring continuous task switching using an instrumented visually guided treadmill (C-Mill VR+) and found fundamental age-related changes regarding step errors and step accuracy while intra- and inter-block task switching. In this session, participants will get an overview of the theoretical background, experimental setup, meaningful findings, and possible preventive and rehabilitative approaches regarding age-related changes in task switching in VGA.

AI-based digital tools and their use in analysing dance and sport in higher education: Creating a learning set, recording and measuring dance movements, annotating and reflecting on screening tests to assess functional movements

4

Christian Büning, Dipl. Sports scientist/B.A. Psychology (Part II),
Sophie Manuela Lindner, M.A. Sports physiotherapy (Parts I + III)
(Institute of Dance and Movement Culture)

3 Timeslots: Mon 21 Aug, 03.15 pm – 05.45 pm (Part I)
Tue 22 Aug, 10.15 am – 12.45 pm (Part II)
Tue 22 Aug, 03.15 pm – 05.45 pm (Part III)

Locations: Gym/Sports hall no. 3 (Part I + III)
MuFo-V-Laboratory, Music Forum (Part II)

Remarks: Limited to 20 participants.

Part I: Learning set – insight into the new Olympic sport Breaking and its competition format
(Sophie Manuela Lindner M.A.)

Breaking is the dance part of hip-hop culture and will be an Olympic sport for the first time in 2024. The cultural development of Breaking and a basic selection of movement material will be discussed during the learning set. First, a short dance choreography will be rehearsed. In the second step, participants learn to develop the movement material into individual 'signature moves' and create their own dance sequences based on the pedagogical principle 'each-one-teach-one', where the participants help each other and share their experiences. Based on this movement material, short dance choreographies will be created in small groups. This workshop is aimed at participants who enjoy dancing and new movement challenges but does not require any former dancing experience.

Part II: Recording and Measurement – using the motion capture system as a research tool to analyse choreographic collaborative processes
(Christian Büning Dipl./B.A.)

Based on the choreographies developed in the first workshop, we will be recording them using a newly established movement lab at the GSU employing a 360° movement analysis. For this purpose, the participants will be asked to present the choreographies in the movement lab and will be taught how a recording and real-time analysis can be performed with a multi-camera setting. Special emphasis will be placed on the technical requirements, the correct calibration of a 360° motion analysis, and adequate analysis options.

Part III: Annotation and Reflection – using the video annotation tool from Motion Bank as a video feedback tool to analyse fundamental movement patterns
(Sophie Manuela Lindner M.A.)

Based on the 'Functional Movement Screen (FMS)', participants will evaluate fundamental movement patterns of pre-recorded videos in small groups. The videos can be analysed using the Motion Bank Software, and participants can then compare their screening results with the results of experts. The workshop will focus on using digital technologies, feedback, and reflection processes and their implementation in movement-based teaching-learning processes.

The manipulation of human beliefs and behaviour: a workshop on designing vignettes for experimental research

5

Dr. Anja Chevalier (Institute of Sport Economics and Sport Management)

1 Timeslot: Thu 24 Aug, 10.15 am – 12.45 pm

Location: SR 93, NawiMedi (Entrance A, 1st Floor)

Abstract: *In this workshop, we will design vignettes for experimental studies in social sciences. Vignettes are descriptions of situations or persons to elicit specific beliefs, attitudes or behaviours among participants in the study.*

Ideally, not necessarily, participants have first ideas about appropriate research questions of their own research projects. We will use the time in the workshop to develop materials for selected research questions in small groups and discuss the advantages and disadvantages of different options for manipulation. We will also highlight central elements of the experimental design in vignette studies in order to improve internal, construct and external validity as well as the reliability of the experiment. Participants will leave the workshop with first drafts of vignettes which they can use for their own experimental research.

Basics and implementation of network meta-analyses in sport, exercise and health

6

Dr. Steffen Held (Institute of Exercise Training and Sport Informatics)

1 Timeslot: Mon 21 Aug, 03.15 pm – 05.45 pm

Location: SR 91, NawiMedi (Entrance A, 1st floor)

Abstract: *Meta-analyses (MAs) have the highest level of evidence next to randomized controlled trials. Classic MAs focus on the comparison of two interventions, e.g., a new intervention with a standard procedure. The standardized mean effect sizes between intervention and control are compared. However, there are often significantly more than two interventions that can be compared to each other. Network meta-analyses (NMAs) provide the opportunity to consider direct and indirect comparisons of different interventions. The frequency, direction, and strength of different intervention comparisons can be used to determine a final ranking of their effectiveness.*

This course is designed to provide an application-oriented foundation into the methodology of NMA. First, the theoretical background will be explained by specifically addressing the combination of direct and indirect evidence, as well as the estimation of indirect variances. Subsequently, the prerequisites of the NMA model (heterogeneity and inconsistency) are examined. A distinction is made between a fixed and a random effect model. Furthermore, the handling of multi-arm studies is discussed and the NMA results are visualized by net graphs and forest plots. P-score rankings will be used for a clear presentation of results. Finally, the validity of the results will be evaluated using heatmaps, netsplit plots and funnel plots. The entire course will be conducted in R.

Functional Near InfraRed Spectroscopy (fNIRS): investigating motor-cognitive functions of the brain

7

Junior-Professor Dr. Ingo Helmich, Robin Gemmerich M.A., Sabrina von Au M.A.
(Institute of Movement Therapy and Movement-oriented Prevention and Rehabilitation)

4 Timeslots: Thu 24 Aug, 10.15 am – 12.45 pm; 03.15 pm – 05.45 pm
Fri 25 Aug, 10.15 am – 12.45 pm; 03.15 pm – 05.45 pm

Location: SR 92, NawiMedi (Entrance A, 1st Floor)

Remarks: Limited to 8-12 participants.

Abstract: *Functional Near Infrared Spectroscopy (fNIRS) constitutes a non-invasive, portable tool for functional monitoring and imaging of human brain hemodynamics (changes both in oxy- and deoxyhemoglobin concentration). Because fNIRS allows for measurements without movement restriction it is particularly useful to investigate brain functions of Motor-Cognition. This neuroimaging modality is also suited for populations and studies where other imaging options are limited, such as infants, children, and patients interacting freely with their environment.*

The workshop will therefore concern the background of fNIRS and its application for studies concerning motor-cognitive tasks. Thus, attendees will learn the physiological background of applying fNIRS as a neuroscientific tool of research for motor-cognition (Part 1 & 2), how to design studies using fNIRS as a neuroscientific tool (Part 3), how to collect data with NIRS, and how to process fNIRS data (Part 5). Thus, attendees will gain not only theoretical knowledge about fNIRS as a neuroscientific tool but also acquire practical (hands on) experience how to use it and perform studies with fNIRS in the field of Motor-Cognition.

Structure and topics

1. Functional Near InfraRed Spectroscopy (fNIRS)
2. Motor-cognition
3. Study designs with fNIRS
4. Record fNIRS data
5. fNIRS data processing

Analysing nonverbal behaviour in sports

8

Professor Dr. Hedda Lausberg
(Institute of Movement Therapy and Movement-oriented Prevention and Rehabilitation)

4 Timeslots: Mon 21 Aug, 10.30 am – 01.00 pm, 03.15 pm – 05.45 pm
Tue 22 Aug, 10.15 am – 12.45 pm, 03.15 pm – 05.45 pm

Location: SR 92, NawiMedi (Entrance A, 1st Floor)

Abstract: *In sports, nonverbal behaviour is omnipresent: in the seconds before a serve in tennis or a soccer penalty shot, in pre-match interviews, during matches or competitions, or in interviews after competitions or even interrogations. In these situations, the athletes' nonverbal behaviour reflects their mental state. As examples, in pre-match interviews Jürgen Klopp's nonverbal behaviour differed before successful and unsuccessful soccer matches, or in doping interrogations Lance Armstrong displayed different types of hand movements when he told the truth versus when he lied.*

In this workshop, we will learn how to reliably analyse nonverbal behaviour, specifically hand movements, with the NEUROGES analysis system. The system is designed for scientific research on nonverbal behaviour and gesture.

Olympic athletes and employment relations in a comparative governance perspective

9

Professor Dr. Jürgen Mittag, Maximilian Seltmann, M.A.
(Institute of European Sport Development and Leisure Studies)

1 Timeslot: Thu 24 Aug, 03.15 pm – 05.45 pm

Location: SR 93, NawiMedi (Entrance A, 1st floor)

Abstract: *Based on empirical data from a European research project on employment and social relations of Olympic athletes in 29 European countries, the workshop will highlight academic approaches to similarities and differences in sport structures in Europe. In addition to methodological questions and considerations on data collection, the focus will be on the analysis of the data material.*

Documents material-based research in sport history

10

Dr. Ansgar Molzberger (Institute of Sport History)

2 Timeslots: Tue 22 Aug, 10.15 am – 12.45 pm, 03.15 pm – 05.45 pm

Location: SR 93, NawiMedi (Entrance A, 1st floor)

Abstract: *Within ongoing discussions in the academic field of sport history, methodology on the whole and particularly hermeneutics have been picked out as central topics over the last years. As prime examples of this, the introductory book Sports History. A Practical Guide by Martin Polley (2007) and The International Journal of the History of Sport's Issue 15 Methodology in Sports History (Vol. 32, 2015) can be mentioned. Throughout the articles and discussions, the importance placed on the understanding and interpretation of primary evidence for research in sport history is stressed – as well as the problem that arises when one takes specific evidence out of its historical context and/or attempts to over-emphasize it (Polley, 2007). Furthermore, according to the German philosopher Hans-Georg Gadamer (1900–2002) and his magnum opus from 1960, "Wahrheit und Methode" (Truth and Method), if we seek to understand a historical phenomenon under the scope of historical distance, we are always subject already to the historically effected consciousness ("Wirkungsgeschichtliches Bewusstsein").*

As various institutions of the GSU Cologne have high-quality, historically grown collections of documents, photos and three-dimensional objects that reflect the complete spectrum of sport and sport sciences – in particular, this concerns the Carl and Liselott Diem Archive at the Institute of Sport History and the Central Library for Sport Sciences – we will practise and discuss research possibilities with the help of primary evidence within this workshop.

Mastering the heart-brain connection through heart rate variability assessment for performance optimisation

11

Caterina Salvotti, Maša Iskra, Stefan Ackermann (Institute of Psychology)

1 Timeslot: Mon 21 Aug, 10.30 am – 01.00 pm (11a) ***OR***
Thu 24 Aug, 03.15 pm – 05.45 pm (11b)

Location: Neurolab, Institute building VI (IG VI, 1st floor, R. 1.32)

Remarks: The workshop is offered twice, on Monday (11a) and Thursday (11b).
Workshops 11a and 11b are identical. They are limited to 8 participants on both days.

Abstract: *Dive into the fascinating world of psychophysiology by exploring the critical role of Heart Rate Variability (HRV) in achieving peak performance and health benefits. This workshop will encompass the theoretical back-*

ground, demonstration of the HRV data collection and analysis, as well as practical training. First, we will present the theoretical models on heart-brain connection and the way to index it through HRV. We will discuss the use of electrocardiography (ECG) for HRV assessment as an informative research method in sport science. Second, we will demonstrate the HRV assessment procedure, including real-time data collection and analysis. The participants will have the opportunity to volunteer to use ECG and the BIOPAC system to collect HRV data. Lastly, we will discuss the practical application of HRV assessment and manipulation using techniques such as voluntary change in breathing frequency and diving reflex to enhance resilience, emotional regulation, and overall performance. The knowledge gained in this workshop can be applied not only to optimize performance but also to promote physical and mental health.

SoccerLab:
Part I: SoccerBot360, Part II: Match analysis in soccer

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Dr. Hans-Erik Scharfen (Part I), Thomas Thönnessen (Part II)
(Institute of Exercise Training and Sport Informatics)

1 Timeslot:	Mon 21 Aug, 10.30 am – 01.00 pm Part I: 10.30 am – 11.45 am, Part II: 11.45 am – 01.00 pm
Locations:	Part I: Soccer Laboratory, Institute Building II (IG II), Part II: SR 50, Institute Building II (IG II)
Remarks:	Meeting point is the entrance area of IG II.

The „small" SoccerBot360 (Umbrella Software Development GmbH, Leipzig)

Part I: SoccerBot360
(Dr. Hans-Erik Scharfen)

In one of the laboratories at our institute stands the "little brother" of the SoccerBot360. It consists of six inter-connected LG flat screens with a screen diagonal of 55 inches, which are arranged in a hexagon with as few gaps as possible next to each other at a height of 1.50 m from the floor. The player or the test person is located in the middle of this construction to get a 360-degree all-around view and to solve the given tasks in the best possible way.

In the "small" SoccerBot360 soccer games can be uploaded to create a more realistic representation compared to ordinary PC testing in 2D, just on a smaller plane compared to the "big" SoccerBot360. Otherwise, except for the non-existent possibility to react after decisions with motor action, e.g., a pass, there are hardly any significant differences in usage.

The "small" SoccerBot360 is also suitable for training or research purposes, where improvements of the players or the test persons occur, which can be analysed exactly. The workshop participants will take part in a game intelligence as well as creativity test in the SoccerBot360 itself and thus learn how they perform in comparison to already tested subjects. The aim on the one hand is to find the best solution in the respective situation (game intelligence) and on the other hand to generate as many solution ideas as possible (creativity) to be successful with my team.

Part II: Match analysis in soccer
(Thomas Thönnessen)

This part of the workshop is designed to deliver insights into the analysis of a soccer game. The focus is on teaching defensive-tactical as well as offensive-tactical criteria of soccer. The acquired knowledge is consolidated by one practical exercise, which includes the analysis of a single player, one from a defensive-tactical and one from an offensive-tactical point of view.

Applied performance diagnostics for individualized training derivations in elite sports

13

Professor Dr. Patrick Wahl, Sebastian Keller M.Sc.
(Institute of Exercise Training and Sport Informatics)

2 Timeslots: Part I: Fri 25 Aug, 10.15 am – 12.45 pm
Part II: Fri 25 Aug, 03.15 pm – 05.45 pm

Locations: Part I: Endurance lab, NawiMedi (Entrance A, 3rd floor, R. 368)
Part II: SR 91, NawiMedi (Entrance A, 1st floor)

Remarks: Limited to 10-12 participants.
Both parts of the workshop should be attended as they build on each other.

Abstract: *Combined spirometry and lactate diagnostics represent the standard method for endurance performance testing in elite sports, as they allow both the assessment of breathing gases (including maximal oxygen uptake [V̇O2max]) and the determination of physiologically derived training intensity zones.*

However, to obtain valid, fine-resolution, and high-precision values as required in elite sports, several aspects have to be considered starting with pre-analytics, e.g., selection of the test protocol, calibration and configuration of spirometry, or capillary blood sampling, through analytics including lactate analyzers to post-analytics, e.g., data processing, fitting, and parameter determination.

The workshop will therefore focus on these three parts (pre-analytics, analytics, and post-analytics) by first introducing participants to capillary blood sampling (in theory and practice) and performing an exemplary diagnostic test including spirometric and blood lactate assessment in the laboratory (Part I). The second part then addresses the technical aspects of spirometry and the advanced analysis of the data collected in Part I.