

Book of abstracts

Sport und Gehirn
Sport et cerveau
Sport and brain

11th congress of the SGS/4S in Fribourg

14. & 15.02.2019

Keynote 1:

Human motor skill learning and consolidation: beneficial effects of exercise

Authors:

Prof. Dr. Jesper Lundbye-Jensen

Department of Nutrition, Exercise & Sports and Department of Neuroscience, University of Copenhagen

Abstract:

During recent years, an emerging body of evidence has demonstrated that an acute bout of cardiovascular exercise can lead to changes in the neuroplasticity of the motor cortex and facilitate motor learning in nondisabled individuals. Recent findings have also suggested that both acute and long-term exercise interventions may have beneficial effects on several forms of memory including procedural motor learning both in non-disabled individuals and in patients. The presentation will focus on factors influencing human motor skill learning and consolidation, present evidence on the behavioral effects of exercise and discuss the potential underlying mechanisms.

Keynote 2:

Concussion in sport

Author:

Dr. Michael J Grey

Reader in Rehabilitation Neuroscience, Acquired Brain Injury Rehabilitation Alliance, School of Health Sciences, University of East Anglia

Abstract:

Concussion is a form of mild traumatic brain injury. Recent high-profile incidences of concussion in professional sport have highlighted the need for greater awareness of the issue and better assessment tools to assist this difficult diagnosis, both at the professional level and in local clubs/schools where trained medical personnel are not necessarily available. Concussion symptoms result from neuropathology rather than structural damage. Following a mechanical insult, a complex cascade of metabolic events produces neurotoxicity, mitochondrial dysfunction and, and with repeated exposure, neurodegeneration. Understanding this pathophysiology can help us to understand the acute and post-concussive symptoms. Emerging physiological assessments show promise as aids to the return to play/work/study decision.

Symposia

Thursday 14.02.2019

16:40 **Symposia 1**

G140

Understanding brain functioning with EEG: perspectives in sport sciences

G120

Gesundheitsförderungsangebote von Krankenversicherern

G230

Therapeutic use of hypoxia- the Lausanne translational approach

Friday 15.02.2019

08:30 **Symposia 2**

G140

Sportliche Interventionen zur Förderung kognitiver Funktionen: Psychologische Konstrukte, behaviorale Daten, neurophysiologische Korrelate

G120

Anti-doping in cycling

G230

A man's world. An intersectional history of women, international sport, and governance

11:00 **Symposia 3**

G140

Motor imagery in competitive sports

G120

Sport for people with a disability

G230

La fabrique des sports nationaux : de l'importance des archives du sport suisse

15:00 **Symposium 4**

Physical activity and brain health

G140

Symposium:

Understanding the brain functioning with EEG: perspectives in sport sciences

Abstract:

In the field of sports performance, the brain plays a predominant role in the regulation of physical exertion and in the processing of environmental cues to generate fast and appropriate sporting actions (anticipation, decision making, actions switching). In the recent years, electroencephalography (EEG) has become one of the most widely used tools for investigating brain functioning. But the very existence of what we might call the “sport neuroscience” is questionable as they are based on a fragile relationship between the inherent constraints when acquiring an EEG signal particularly sensitive to artifacts, the complexity and the speed of the electro-cortical processes and the desire to innovate training programs. To legitimize the place of the neurosciences in sport research, it is essential to seek the application of advanced EEG signal analyses methods. The aim of this symposium is to present three types of electroencephalogram analyses and to discuss their benefits to better understand the adaptations of brain functioning in relation to physical exercise and perceptual-cognitive expertise of athletes.

Contribution 1:

The neural correlates underlying the use of contextual and kinematic information processes during anticipation in cricket

Authors:

Simonet M¹, Boumediene Meziane H², Runswick O³, North J⁴, Williams M⁵, Barral J¹, Roca A⁴

¹Institute of Sport Sciences, University of Lausanne, Switzerland; ²Brain Electrophysiology Attention Movement Laboratory, University of Lausanne, Switzerland; ³Department of Sport and Exercise Sciences, University of Chichester, UK; ⁴Expert Performance and Skill Acquisition Research Group, School of Sport, Health and Applied Science, St Mary’s University, Twickenham, London, UK; ⁵Department of Health, Kinesiology and Recreation, College of Health, University of Utah, Salt Lake City, Utah, USA

Abstract:

Anticipation is the ability to accurately predict the outcome of an opponent’s actions ahead of the act itself. In cricket, recent studies reported that experts are able to use two sources of information: low-level kinematic cues from the bowler but also high-level contextual information related to the event (Runswick et al., 2018).

This study aims to investigate the electrocortical activity underlying the use of these two sources of information in expert and novice cricket players.

We recorded the electroencephalographic (EEG) activity in 14 expert and 10 novice cricket players when anticipating deliveries from bowlers in a video-based simulation task where the type of information presented to participants was manipulated. Video clips were displayed across three conditions, including clips with contextual information (game situation and field setting images), clips with kinematic information (video) and clips with both sources of information. Trials were occluded immediately after the ball release and anticipation measured by marking predicted ball location on scaled diagrams. Differences in anticipation accuracy were assessed with a Group (Expert; Novice) x Condition (Context; Video; Both information) mixed ANOVA analysis. The spectral changes of the EEG signal were evaluated with Event Related Spectral Perturbation (ERSP) analyses. We used non-parametric cluster-based permutation tests (Maris & Oostenveld, 2007) to assess conditional differences in sensor space and cluster-based randomization tests to control for multiple comparisons (Matlab, Fieldtrip toolbox).

Behaviourally, the results demonstrated that experts showed better anticipation accuracy across the three conditions ($p < 0.05$). Electrophysiologically, the ERSP analyses showed significant differences ($p < 0.01$) in superior alpha and beta bands between the video and the game situation. While both groups demonstrated stronger desynchronisation in the video compared to the game situation, the spatial location of these effects was more widespread in the novices (a cluster of 11 centro-posterior electrodes) than in the experts (a cluster of 4 posterior electrodes). A similar pattern of results was found for the difference between the game situation and the field setting.

Taken together, our results support the hypothesis that all the available sources of information are relevant for the expert players to predict future actions' outcome. In the group of novices, the EEG results suggest that they rely more on the field setting and the kinematic information rather than on the game situation. To the best of our knowledge, this is the first study to provide electrocortical evidence of skill-based differences in the processing of contextual and kinematic information.

References:

- Maris, E., & Oostenveld, R. (2007). Nonparametric statistical testing of EEG- and MEG-data. *Journal of Neuroscience Methods*, 164(1), 177-190. <https://doi.org/10.1016/j.jneumeth.2007.03.024>
- Runswick O. R., Roca A., Williams A.M., McRobert A., North J. (2018). The temporal integration of information during anticipation. *Psychology of Sport and Exercise* 37:100-108. doi:10.1016/j.psychosport.2018.05.001

Contribution 2:

Electrical Neuroimaging analyses of event-related potentials and their relevance for movement and sport sciences

Author:

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Abstract:

Electroencephalography is an easily accessible and quickly implemented non-invasive brain measure tool. Thanks to recent technical and analytical advances, EEG has become a true brain-imaging tool. As an example of the many possibilities offered by EEG to study the brain-behavior relationships, we present the so-called 'electrical neuroimaging' analyses of event-related potentials and discuss how sport sciences may benefit from its interpretational strengths.

Electrical neuroimaging analyses of the ERPs go far beyond the canonical analyses of the amplitude and latency ERP voltage waveforms of a subset of electrodes and periods of interest: they take advantage of the entire electrode montage and focus on global measures of the topography and power of the electric field at the scalp. Because changes at the levels of these metrics across experimental conditions necessarily follow from modifications in the configuration and response strength of the underlying active brain networks, their statistical analyses provides neurophysiologically interpretable outcomes. Advances in source estimations analyses further allow identifying the loci of the active sources in the brain.

Combined with the high temporal resolution and portability of the EEG, electrical neuroimaging analyses of the ERP thus constitute an ideal approach to assess the spatio-temporal organization of motor and cognitive functions in naturalistic setting with freely behaving individuals.

References:

- Michel, C. M., Murray, M. M. (2012). Towards the utilization of EEG as a brain imaging tool. *NeuroImage*, 61(2), 371-385. doi:10.1016/j.neuroimage.2011.12.039

Contribution 3:

Applying the EEG microstate analyses to investigate the spontaneous brain activity after a single-bout of physical exercise

Author:

Barral J¹

¹Institute of Sport Sciences, University of Lausanne, Switzerland

Abstract:

When the brain is not engaged in a specific cognitive or motor task, instead of remaining inactive, interconnected neural networks are dynamically activated to optimize the continuously processing of internally and externally stimuli. However, this spontaneous brain activity can be modulated by numerous endogenous (e.g. emotion, fatigue) or exogenous (e.g. heat, daytime) factors.

The effect of sessions of physical exercises has been quite extensively investigated revealing an impact upon global oscillatory brain activity. However, resting-state power analyses considered the brain structures independently, in tight frequency bands, and neglect the dynamic of brain functioning. By using high-density EEG, resting brain activity can be described as a set of limited (typically four) and stable (60 to 150 milliseconds) brain topographies that appear successively and rapidly in a well-organized dynamic with a representative time-scale of the speed of brain processing (Michel & Koenig, 2018).

In this talk, I will shortly describe the principles of EEG microstate analyses (basically cluster analyses) and continue by presenting our last two studies about the effect of a single-bout of physical exercise on the temporal parameters of the EEG microstates just after the exercise but also during a 60-minute recovery period. In the first study (Spring et al., 2017; N=20 endurance-trained male athletes; 30±7 y.o.), we have also assessed neuromuscular parameters (MVC, VAL and P100Hz) and in the second study (Spring et al., 2018; N=38 healthy volunteers; 22 women; 24±4 y.o.) the cardiovascular indices (from heart rate variability). In the two studies the results showed an increase of the mean duration (ms) and the time coverage (%) of one specific topography (map C). In addition, we obtained significant correlations between the modulation of MVC and P100Hz with the map C temporal changes (study one). In the study two, the HRV and map C parameters did not return to baseline after 60 minutes. However, we did not find significant relationships between this two sets of measures.

Considering that the microstate C has been associated to the salience resting state network (with anterior insula and cingulate cortices), we suggest that the increased stability and dominance of map C might be related to the increased neural traffic from peripheral somatosensory and autonomic cardiovascular afferences.

References:

- Michel, C. M., & Koenig, T. (2018). EEG microstates as a tool for studying the temporal dynamics of whole-brain neuronal networks: A review. *NeuroImage*, 180, 577-593. <https://doi.org/10.1016/j.neuroimage.2017.11.062>
- Spring, J. N., Tomescu, M. I., & Barral, J. (2017). A single-bout of Endurance Exercise Modulates EEG Microstates Temporal Features. *Brain Topography*, 1-12. <https://doi.org/10.1007/s10548-017-0570-2>
- Spring, J. N., Bourdillon, N., & Barral, J. (2018). Resting EEG Microstates and Autonomic Heart Rate Variability Do Not Return to Baseline One Hour After a Submaximal Exercise. *Frontiers in Neuroscience*, 12. <https://doi.org/10.3389/fnins.2018.00460>

Symposium:

Gesundheitsförderungangebote von Krankenversicherern

Contribution 1:

Health management system for students at the University of Freiburg

Authors:

Gollhofer A¹, Backhaus A¹, Poggel K¹, König D¹

¹Universität Freiburg, Deutschland

Abstract:

Introduction: With more than 25.000 students at the University of Freiburg, the proposed project will concentrate on the implementation of a health management system to support a broad aspect of health-related issues of the students during their time at the University. In cooperation with health insurance companies, a health management system will be elaborated to meet major prevention criteria with special reference to students.

Methods: The project has a broad executive branch. Here, the students will be offered sports programs organized both by University driven organizations as well as by health insurances. Furthermore, prevention initiatives provided by our psychological and nutritional department are essential parts. Scientific evaluation programs to analyze attendance and compliance characteristics and to evaluate health benefits ensure an assessment of the sustainability of the entire health management system.

Results: So far, the entire project is in its starting phase. First courses will run in 2019. Thus, no detailed responses will be available at the moment.

Contribution 2:

“What type of activity suits me?” Feasibility of an individualized exercise and sport counselling concept

Authors:

Schmid J¹, Schorno N¹, Gut V¹, Conzelmann A¹

¹Institute of Sport Science, University of Bern, Switzerland

Abstract:

Introduction: Exercise and sport counselling is seen as a promising method for promoting behavioral change in clinical and non-clinical settings. One advantage is that individual characteristics can be considered carefully and used to tailor advices. Existing concepts of counselling often concentrate on the *quantity* of exercise and sport. They focus on identifying appropriate training loads for improving physical performance and maximizing health. In contrast to this, the *quality* of exercise and sport is rarely taken into account in counselling concepts. To close this research gap, a novel counselling concept systematically considers individual preferences and focus on identifying suitable types of activities. The counselling consists of four elements: (1) a standardized assessment of factors relevant for exercise and sport behavior (e.g. motives and goals; Schmid, Gut, Conzelmann, & Sudeck, 2018), (2) an individualized feedback of the results (e.g. motive-based type of sport person; Sudeck, Lehnert, & Conzelmann, 2011), (3) trial exercise and sport lessons of varying content, and (4) an one-to-one conversation with the counsellor about suitable activity types. The aim of the present study was to make a primary evaluation of the feasibility of the counselling concept.

Methods: This feasibility study was conducted within the scope of a one-day counselling event. It was organized in cooperation with a Swiss health insurance. 37 adults ($M_{age} = 39.73$ years, 70%

women, 32% <75 min exercise and sport/week) took part at the event. Directly after the counselling people were asked on a paper-pencil-questionnaire how satisfied they were with the event (rating on a 5-point Likert scale from 1 “very dissatisfied” to 5 “very satisfied”). Furthermore, semi-structured interviews were conducted with seven participants ($M_{age} = 35.57$ years, 71% women, 86% <75 min exercise/week) to investigate if and why single elements of the counselling were perceived as helpful.

Results: Overall the participants were very satisfied with the counselling ($M = 4.59$, $SD = .80$). The interviews revealed that individuals perceived trial exercise and sport lessons as helpful because they gained diverse experiences and had to reflect on them immediately. Participants perceived the one-to-one conversation as beneficial because they reflected upon suitable activities, and consequently they noticed their preferences. Furthermore, individuals were satisfied with the presentation of all individual data, because counsellors illustrated and explained them in-depth.

Discussion/Conclusion: To sum up, the individualized counselling was evaluated positively overall, and every counselling elements was perceived as helpful. In future studies, follow-up contacts could be arranged to provide ongoing support. Furthermore, the effectiveness of the counselling should be examined with a longitudinal field experiment.

References:

Schmid, J., Gut, V., Conzelmann, A., & Sudeck, G. (2018). Bernese motive and goal inventory in exercise and sport: Validation of an updated version of the questionnaire. *PLOS ONE*, 13, e0193214.

Sudeck, G., Lehnert, K., & Conzelmann, A. (2011). Motivbasierte Sporttypen: Auf dem Weg zur Personorientierung im zielgruppenspezifischen Freizeit- und Gesundheitssport. *Zeitschrift für Sportpsychologie*, 18, 1–17.

Contribution 3:

Remote personal health coaching: Pilot project with health insurance SWICA

Authors:

Zahner L¹, Fischer X¹, Gerber M¹, Faude O¹

¹Department of Sport, Exercise and Health, University of Basel, Switzerland

Abstract:

Introduction: Regular physical activity and a healthy diet reduce the risk of non-communicable diseases such as obesity, cardiovascular disease and diabetes (Lee et al., 2012). During recent years, Swiss health insurances have therefore offered financial support, e.g. for a fitness center subscription, in order to promote the health of their customers. Currently, insurers are interested in an individual and sustainable solution to support customers adopting a healthier lifestyle. This offers the opportunity to bring evidence-based health promotion programs into practice and to evaluate them on an ongoing basis. In recent years, a remote physical activity promotion program based on behavioral change techniques has been developed at the Department of Sport, Exercise and Health in Basel. This program was scientifically evaluated within the PhD project ‘Movingcall’. Telephone coaching and the use of a web application proved to be effective and well accepted means to promote physical activity in adults. This program is currently implemented in a pilot project with the SWICA health insurance company. The feasibility, the acceptance and the efficiency (i.e. cost-effectiveness) of the program are thereby analyzed in a real world setting.

Method: The SWICA pilot project is designed as a pre-post comparison study. The target population of the examined program are individuals, who wish to optimize their diet or increase their physical activity. 130 SWICA employees as well as friends and family members were recruited for the study.

All participants receive 15 telephone coaching sessions over the course of 12 months. These conversations are conducted with decreasing frequency by trained coaches. The coaching content consists of evidence-based behavior change techniques and recommendations based on exercise and nutritional science. All participants have access to a web application for the planning and self-monitoring of their physical activity and nutrition. In collaboration with their coach, it is aimed for participants analyzing and overcoming individual barriers to a healthier lifestyle. Outcomes are assessed at baseline, after 6 months and after a year. Primary outcome is self-reported physical activity assessed by a structured interview (Schilling et al., 2018). In addition, participants are asked to answer various acceptance-related questions (Sekhon, Cartwright, & Francis, 2017), to report their dietary habits, their body weight, and to measure their waist-to-hip ratio.

Discussion: The implementation and ongoing evaluation of evidence-based physical activity promotion programs can be considered as one of the key objectives of exercise science in future. The SWICA pilot project offers the opportunity to test the feasibility and effectiveness of telephone based personal health coaching in a real world setting. This project can be considered an important step towards the implementation of personal and sustainable health promotion.

References:

- Lee, I. M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., & Katzmarzyk, P. T. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet*, 380(9838), 219-229. doi:10.1016/s0140-6736(12)61031-9
- Schilling, R., Scharli, E., Fischer, X., Donath, L., Faude, O., Brand, S., . . . Gerber, M. (2018). The utility of two interview-based physical activity questionnaires in healthy young adults: Comparison with accelerometer data. *PloS One*, 13(9), e0203525. doi:10.1371/journal.pone.0203525

Symposium:

Therapeutic use of hypoxia – the Lausanne translational approach

Abstract:

Investigating the benefits vs limitations/risks of exercise in hypoxia requires a large range of methods and a translational approach. In Lausanne, several studies (from mice to elite athletes. with individual with obesity, patients with peripheral artery diseases, elderly subjects, military pilots) are conducted for analysing the effects of systemic vs localized hypoxia in normobaric vs hypobaric hypoxia on the vascular relaxation, endothelial function, muscle transcriptional responses, muscle oxygenation, body composition, mechanics of locomotion, metabolism, cerebral vasoreactivity.

Altogether, this broad range of studies aim to clarify the therapeutic benefits of hypoxia and - if confirmed - the possibilities to better use of the Alpine space for the health of the local population.

Contribution 1:

Hypoxia: Friend or Foe - Overview of potential therapeutic mechanisms of hypoxia

Authors:

Millet G¹

¹ISSUL – Unil

Abstract:

Exposure to altitude (> 2500 m) triggers a series of physiological responses, including maladaptive ones with three forms of acute altitude illness, acute mountain sickness, high-altitude cerebral oedema and high-altitude pulmonary oedema¹. In addition, in patients or elderly individuals, altitude is generally associated with increased health risks through enhanced sympathetic vasoconstrictor activation, obstructive sleep apneas, hypoxemia, pulmonary hypertension, arrhythmias and alterations of postural control.

However, “sola dosis facit venenum” (The dose makes the poison) and recent studies suggest that appropriate dose (severity, intermittence, total exposure,..) of hypoxia may lead to therapeutic benefits in healthy young or elderly subjects as well as in patients with different metabolic, cardiovascular or respiratory diseases such as hypertension, chronic obstructive pulmonary disease, obesity, cancer or coronary artery disease².

Living at altitude seems to have contradictory effects on different mortality risk factor (i.e. positive on cancer vs deleterious on depression/suicide). We aim to present the state of the art regarding the mechanisms involved and the optimal hypoxic modalities.

Moreover, the potential additional health benefits provided by exercising in hypoxia, when compared to normoxia, will be presented.

References:

1. Luks, A. M., Swenson, E. R. & Bartsch, P. Acute high-altitude sickness. European respiratory review : 26 (2017).
2. Millet GP, Debevec T, Brocherie F, Malatesta D, Girard O. (2016). Therapeutic Use of Exercising in Hypoxia: Promises and Limitations. *Frontiers in Physiology, Exercise Physiology.* 7,224.

Contribution 2:

New insights into the effects of supramaximal exercise training in hypoxia on muscle energy metabolism: a mouse study

Authors:

Pellegrin M¹
¹CHUV

Abstract:

Introduction: Supramaximal exercise training in hypoxia (SupraH, also called repeated-sprint training in hypoxia) is a recent training method providing performance enhancement in team- or racket- sport players¹. This method differs from traditional low-intensity continuous training (Low) and maximal intensity interval-training (IHT), and also from supramaximal exercise training in normoxia (SupraN), since SupraH performed at maximal intensity leads to a greater muscle perfusion and oxygenation and specific muscle transcriptional responses in humans^{2,3}. Muscle adaptations in response to SupraH still remain largely unknown, particularly in term of energy metabolic adaptation. The present study therefore compared the effect of Supra versus Max versus Low in normoxia and hypoxia on muscle expression of key genes involved in energy metabolism in mice.

Methods: C57BL/6J male mice were subjected to treadmill running at three different intensities as follows: Low (40 min running at 40% of maximal aerobic speed [V_{max}], IHT (8x1 min running at 90% of V_{max}) and Supra (4 series of 5 bouts of sprints at 150% of V_{max}). Trainings were performed in normoxia (21% O₂) and hypoxia (13% O₂), three times per week for four weeks. Total work was matched between groups. Non-exercising mice served as controls. Real-time reverse-transcription polymerase chain reaction analysis was used to determine expression of genes involved in glucose metabolism [glucose transporter (GLUT)-1, glucose transporter (GLUT)-4 and glycogen synthase 1 (GSY1)], fatty acid metabolism [uncoupling protein 2 (UCP2), carnitine palmitoyltransferase 1 beta (CPT1 β), cluster of differentiation 36 (CD36), fatty acid binding protein 3 (FABP3), hormone-sensitive lipase (HSL) and peroxisome-proliferator-activated receptor gamma (PPAR- δ)], and mitochondrial biogenesis [NADH dehydrogenase, subunit 1 (ND1), NADH dehydrogenase, subunit 6 (ND6), cytochrome b (CYTB) and 16sRNA] in gastrocnemius muscle.

Results: No significant differences in mRNA levels of studied genes were found among the seven experimental groups of mice.

Discussion/Conclusion: Our results show that SupraH did not modify muscle expression of genes related to energy metabolism in healthy mice. These results are contradictory to transcriptional responses observed in trained humans where SupraH induced a larger glycolytic genes expression^{2,3}.

References:

- 1 Girard, O., Brocherie, F. & Millet, G. P. Effects of Altitude/Hypoxia on Single- and Multiple-Sprint Performance: A Comprehensive Review. *Sports Med* 47, 1931-1949, doi:10.1007/s40279-017-0733-z (2017).
- 2 Brocherie, F. et al. Repeated maximal-intensity hypoxic exercise superimposed to hypoxic residence boosts skeletal muscle transcriptional responses in elite team-sport athletes. *Acta Physiol (Oxf)* 222, doi:10.1111/apha.12851 (2018).
- 3 Faiss, R. et al. Significant molecular and systemic adaptations after repeated sprint training in hypoxia. *PLoS ONE* 8, e56522, doi:10.1371/journal.pone.0056522 (2013).

Contribution 3:

Walking in hypoxia: an innovative tool in weight management programs

Authors:

Malatesta D¹
¹ISSUL – UNIL

Abstract:

Over the past decades, the worldwide prevalence of obesity has more than doubled. Prevention and treatment of obesity and its comorbidities are a focus on the public agenda. Regular physical exercise such as walking has a pivotal role in increasing energy expenditure, physical fitness and decreasing chronic disease and mortality (Donnelly et al., 2009). However, the effectiveness and adherence to prescribed or spontaneous physical activity programs in obese individuals remain controversial (Luke and Cooper, 2013) due to the objective and subjective difficulties of exercising in this population. Among these exercise limitations, orthopedic comorbidity risks are also involved in decreasing adherence to the training programs in individuals with obesity (Hootman et al., 2002). Hence, training at slower walking speed, reducing the joint loads and musculoskeletal pathology risk, may be an adapted training tool to decrease or minimize the drop-outs in weight management programs (Browning et al., 2006). Nevertheless, the exercise intensity at slower walking speed may be too low to reach the relative intensity level necessary to obtain optimal exercise-induced cardiovascular benefits. However, a hypoxic walking training program at slower walking speed than in normoxia may allow individuals with obesity to exercise at higher relative intensity in hypoxia, because of the well-known decrease in maximal oxygen uptake under hypoxic conditions. In fact, it has been reported that hypoxic training on a treadmill or cycle ergometer over a short period (4-8 weeks) in individuals with obesity led to similar or larger improvements in aerobic fitness, body mass and composition, and metabolic risk markers while using lower workloads compared to similar training under normoxia (Hobbins et al., 2017).

The aim of this presentation will be to introduce the recent findings using hypoxic training in weight management programs with a special focus on normobaric hypoxic walking training (Fernandez Menendez et al., 2018). Our results showed that a walking training program under hypoxia at slower preferred walking speed than in normoxia elicited similar responses in terms of metabolic risk factors, energetics, and mechanics of walking in individuals with obesity. Both programs increased preferred walking speed, decreased rating perceived exertion, and induced gait-pattern adaptations, which protected against orthopedic injury in these individuals. These findings suggest that walking in hypoxia may be an innovative and promising tool in weight management programs.

References:

- Browning et al. (2006). *J Appl Physiol* (1985) 100(2), 390-398.
Donnelly et al. (2009). *Med Sci Sports Exerc* 41(2), 459-471.
Fernandez Menendez et al. (2018). *Obesity (Silver Spring)* 26(5), 819-827.
Hobbins et al. (2017). *Am J Physiol Regul Integr Comp Physiol* 313(3), R251-R264.
Hootman et al. (2002). *Med Sci Sports Exerc* 34(5), 838-844.
Luke & Cooper (2013). *Int J Epidemiol* 42(6), 1831-1836.

Contribution 4:

Leg vs arm cycling repeated sprints with blood flow restriction and systemic hypoxia

Authors:

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¹Université de Lausanne - UNIL - ISSUL, Switzerland

Abstract:

Introduction: During systemic hypoxia exposure, the limitation of oxygen availability induces vasodilation to increase blood flow and maintain oxygen delivery to the muscle. While when an external pressure is applied to locally create partial restriction of blood flow (blood flow restriction, BFR) to the limbs via vascular occlusion or ischemia, blood flow is reduced by vascular resistance and venous return is considerably reduced [1]. Thus, there are both differing methods (local and systemic) and intrinsic mechanisms (metabolic vasodilation and vascular resistance) by which a hypoxic environment may exist, and in which can create alterations of vascular conductance and blood flow. The aim was to compare changes in tissue and cerebral oxygenation, as well as metabolic and performance responses during conditions of BFR and systemic hypoxia during submaximal and repeated sprint tests to exhaustion (RST) between leg- and arm-cycling exercises. The combination of BFR and/or hypoxia led to increased changes in [HHb] and [tHb] likely due to greater vascular resistance, to which arms were more responsive than legs.

Methods: Seven healthy and active volunteers were involved in this study (five men and two women; mean \pm SD; 26.6 \pm 2.9 years old; 74.0 \pm 13.1 kg; 1.76 \pm 0.09 m; 14.1 \pm 4.9 % body fat). A total of five sessions first in leg cycling and five sessions for arm cycling (1 familiarization and four testing sessions for both leg and arm cycling) as part of a randomized protocol to assess responses during both a 6-min submaximal stage and a maximal RST. The submaximal (6-min steady-state) and RST (10 s maximal sprints with 20 s recovery until exhaustion) were performed to measure power output and metabolic equivalents as well as oxygenation (near-infrared spectroscopy) of the muscle tissue and prefrontal cortex. Testing visits were performed with two different levels of hypoxia, (~380 m, FIO₂ 20.9%; ~3800 m normobaric hypoxia, FIO₂ 13.1 \pm 0.1%); as well as two levels of blood flow restriction, no BFR (0%) and 45% of the pulse elimination pressure.

Results: Arms demonstrated greater changes in concentration of deoxyhemoglobin (Δ [HHb]) and total hemoglobin concentration (Δ [tHb]), as well as the absolute maximum tissue saturation index (TSI) than legs ($p < 0.001$), demonstrating a greater capacity for oxygen extraction. During submaximal exercise, total hemoglobin concentration ([tHb]) 65% higher ($p < 0.01$) and TSI 7% lower ($p < 0.001$) in arms versus legs, suggesting that arms had greater oxygen demand than legs. Further, there were greater changes in tissue blood volume [tHb] during BFR compared to control conditions ($p = 0.017$, $F = 5.45$).

Discussion/Conclusion: Interestingly, even though the arms are known generally to extract less oxygen than the legs, as found in the current submaximal intensity exercise, the present study demonstrated with maximal repeated sprint exercise (RST) that arms are able to elicit greater changes in oxygenation than legs (greater Δ [HHb] and higher TSI) and thus may produce increases in oxygen extraction to match the higher oxygen demand. In addition, the combination of hypoxia and/or BFR demonstrated greater oxygen extraction as well as greater changes in tissue blood volume ([tHb]) likely due to greater vascular resistance, of which the arms have greater reactivity than legs. This suggests that arms are more responsive or sensitive to changes in oxygenation, specifically the hypoxia-induced reduction in oxygen supply (local or systemic), and likely have a greater capacity to increase oxygen extraction than legs with this type of maximal repeated sprint exercise.

References:

1. Willis SJ, Alvarez L, Borrani F, Millet GP. Oxygenation time course and neuromuscular fatigue during repeated cycling sprints with bilateral blood flow restriction. *Physiol Rep*. 2018;6(19),e13872.

Symposium:

Sportliche Interventionen zur Förderung kognitiver Funktionen: Psychologische Konstrukte, behaviorale Daten, neurophysiologische Korrelate

Abstract:

In der letzten Dekade hat sich die empirische Evidenz rasant gemehrt, die zeigt, dass sich sportliche Aktivität nicht nur positiv auf die körperliche Gesundheit, sondern auch auf die kognitive Leistungsfähigkeit auswirken kann. Welche Aktivität die gewünschten Effekte aber am stärksten hervorzubringen vermag und welches die zugrunde liegenden Wirkmechanismen sind, ist nach wie vor unklar. Die Klärung dieser Fragen, ist allerdings für eine zielgerichtete Förderung der kognitiven Leistungsfähigkeit durch Sport- und Bewegungsaktivitäten von zentraler Bedeutung.

Die Autoren der Symposiumsbeiträge beschäftigen sich daher allesamt mit der Frage nach der optimalen Gestaltung von „chronischen“ sportlichen Aktivitäten zur Förderung der exekutiven Funktionen von Kindern, Jugendlichen und älteren Erwachsenen.

Ludyga und Kollegen haben untersucht, ob sich ein kombiniertes (aerobes und koordinatives) Training im schulischen Setting auf die Netzhautmikrozirkulation und ereigniskorrelierte Potentiale während einer Inhibitionsaufgabe auswirkt. Benzing et al. stellen erste Ergebnisse der Brainfit-Studie dar, in der sie die Effekte einer 8-wöchigen Exergame-Intervention mit ehemals krebserkrankten Kindern und Jugendlichen auf die exekutiven Funktionen, die Motorik, das Selbstkonzept und die Lebensqualität untersucht haben. Adcock et al. berichten über ihre Multikomponenten-Exergames-Intervention, bei der eigenständig lebende Senioren über 16 Wochen dreimal pro Woche ihre motorischen und kognitiven Funktionen trainiert haben.

Contribution 1:

Effects of combined aerobic and coordinative training on neural correlates of inhibitory control and retinal microcirculation in adolescents

Authors:

Ludyga S¹, Köchli S¹, Gerber M¹, Pühse U¹, Hanssen H¹

¹Department of Sport, Exercise and Health, University of Basel, Switzerland

Abstract:

Introduction: Regular engagement in aerobic and coordinative exercise has been found to benefit executive function (i.e. top-down control of behavior) in children and adolescents. Less is known on the neurophysiological mechanisms that underlie such exercise-induced improvements. The present study investigated the effects of combined aerobic and coordinative exercise on neural correlates of inhibitory control and retinal microcirculation.

Methods: In this cluster-randomized trial, 36 adolescents were allocated to an exercise and control group. An 8-week aerobic and coordinative exercise program with 5 20-min sessions per week was prescribed to the exercise group, whereas the control group was encouraged to have social interactions. Prior to and following the intervention, the P300 component of event-related potentials elicited from a Stroop task was recorded using electroencephalography. Additionally, the central retinal arteriole equivalent (CRAE) was assessed from retinal photographs.

Results: Cluster-based permutation testing revealed that the exercise compared to the control group showed a greater increase of the P300 amplitude over the intervention period. Moreover, analysis of covariance showed that post-test CRAE was higher in the exercise compared to the control group, when adjusted for pre-test values. Based on the examination of correlation coefficients, an association was found between changes in P300 amplitude and CRAE from pre- to post-test.

Discussion/Conclusion: The findings indicate that a mixed aerobic and coordinative exercise program implemented during school-break time increases the allocation of attentional resources in a cognitive task demanding inhibitory control. This change is paralleled by a favorable facilitation of the retinal microvasculature.

Contribution 2:

Die «Brainfit» Studie: Exekutive Funktionen und motorische Fähigkeiten bei Kinderkrebsüberlebenden

Authors:

Benzing V¹, Federspiel A², Spitzhüttli J³, Siegwart V³, Kiefer C⁴, Slavova N⁴, Grotzer M⁵, Steinlin M³, Leibundgut K⁶, Schmidt M¹

¹Institute of Sport Science, University of Bern, Bern, Switzerland; ²Translational Research Center, University Hospital of Psychiatry, University of Bern, Bern Switzerland; ³Division of Neuropaediatrics, Development and Rehabilitation, University Children's Hospital Bern, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland; ⁴Support Center for Advanced Neuroimaging (SCAN), Institute of Diagnostic and Interventional Neuroradiology, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland; ⁵Division of Pediatric Oncology, University Children's Hospital Zurich, Zurich, Switzerland; ⁶Division of Pediatric Hematology and Oncology, University Children's Hospital Bern, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland

Abstract:

Einleitung: Aufgrund verbesserter Diagnose und Behandlung ist in den letzten Jahren die Überlebenswahrscheinlichkeit bei Kinderkrebs auf über 80 % angestiegen. Häufig kommt es aber bei ehemals krebserkrankten Kindern und Jugendlichen (EKK) zu Spätfolgen, wie beispielsweise verminderte kognitive Leistungsfähigkeit und tiefere Lebensqualität. Da bei gesunden Kindern die kognitiven Funktionen im Zusammenhang mit den motorischen Fähigkeiten stehen und das physische Selbstkonzept zentral für das Wohlbefinden zu sein scheint, untersucht die «Brainfit» Studie diese Spätfolgen und Zusammenhänge bei EKK. Darüber hinaus soll die Wirksamkeit verschiedener Rehabilitationsmassnahmen mithilfe der «Brainfit» Studie evaluiert werden.

Methoden: Insgesamt wurden dafür 85 EKK mit 55 gesunden Kindern hinsichtlich den Exekutiven Funktionen (Stroop-Aufgabe, Corsi-Block Aufgabe), motorischen Fähigkeiten (DMT) und dem Physischen Selbstkonzept (PSDQ-S) sowie der Lebensqualität (HRQOL) mittels unabhängigen t-Tests verglichen. Zusätzlich wurden Pearson-Korrelationen berechnet, um potentielle Zusammenhänge zwischen den Variablen zu prüfen. In einem weiteren Schritt wurde eine Mediationsanalyse zwischen den motorischen Fähigkeiten, dem physischen Selbstkonzept und der Lebensqualität berechnet. Ausserdem konnten insgesamt 72 EKK einer Intervention oder Kontrollgruppe zugeordnet werden.

Resultate: EKK weisen eine tiefere Leistung in den Exekutiven Funktionen ($p < .0005$, $g = .640$) und den motorischen Fähigkeiten ($p < .0005$, $g = .888$) auf. Die Exekutiven Funktionen waren dabei signifikant mit den motorischen Fähigkeiten (Koordination: $r = .509$, $p < .0005$; Kraft: $r = .315$, $p = .005$; Ausdauer: $r = .351$, $p = .003$) assoziiert. Darüber hinaus zeigte sich ein tieferes physisches Selbstkonzept hinsichtlich der Facette der Koordination ($p < .0005$, $gHedges = .847$). Eine Mediationsanalyse ergab ausserdem, dass diese Facette der Koordination, ein signifikanter Mediator für den Zusammenhang zwischen tatsächlicher Koordinationsleistung und der Lebensqualität bei EKK darstellte (signifikanter indirekter Effekt: $ab = .20$).

Diskussion/Konklusion: Die Ergebnisse zeigen, dass Spätfolgen in den Exekutiven Funktionen und motorischen Fähigkeiten bei EKK auftreten und miteinander verknüpft sind. Darüber hinaus wird ein Zusammenhang zwischen der Koordination und der Lebensqualität durch das physische Selbstkonzept bei EKK mediiert. Diese Ergebnisse sprechen für die Erhebung der motorischen

Fähigkeiten in der Standardnachsorge. Ausserdem zeigen sie, dass sportliche Interventionen dringend benötigt werden, welche das Potential haben sich positiv auf die Exekutiven Funktionen, die motorischen Fähigkeiten, das physische Selbstkonzept und die Lebensqualität auszuwirken.

Contribution 3:

Effekte eines Multikomponenten-Exergame Trainings für zu Hause auf die Motorik, Kognition und Hirnstrukturen von Senioren – Eine randomisierte kontrollierte Studie

Authors:

Adcock M¹, Post J¹, Fankhauser M¹, de Bruin E¹

¹Department für Gesundheitswissenschaften und Technologie, Institut für Bewegungswissenschaften und Sport, ETH Zürich, Schweiz

Abstract:

Einleitung: Altersbedingte Veränderungen stehen in Zusammenhang mit Störungen im Gangbild und einem höheren Sturzrisiko. Stürzen führen oft zu Verletzungen, Mobilitätseinschränkungen und einer reduzierten Lebensqualität. Viele alltägliche Bewegungen, wie Laufen, sind Handlungen, welche das gleichzeitige Zusammenspiel von motorischen und kognitiven Funktionen benötigen. Exergames stellen ein kombiniertes motorisch-kognitives Training dar und verfügen über ein hohes Potential, altersbezogenen Veränderungen entgegenwirken und Stürze verhindern zu können. Das Ziel dieser Studie war es, die Effekte eines neu entwickelten Multikomponenten-Exergames (Active@Home, <http://www.active-at-home.com>) auf die Motorik, Kognition und Hirnstrukturen von Senioren zu untersuchen im Vergleich zu einer Kontrollgruppe ohne Intervention.

Methoden: Bei dieser Studie handelte es sich um eine randomisierte kontrollierte Studie, wobei 40 eigenständig-lebende und gesunde Senioren (> 65 Jahre) eingeschlossen und zufällig auf zwei Gruppen (Interventions- und Kontrollgruppe) aufgeteilt wurden. Die Probanden in der Interventionsgruppe (N=20) trainierten dreimal pro Woche, 30-40 Minuten/Training, für 16 Wochen mit einem virtuelle Realität-basierten Exergame zu Hause. Das Training beinhaltete Tai Chi-basierte Übungen und Tanzschritte für Kraft- und Gleichgewichtstraining. Spezifische Hirnfunktionen wurden mittels kognitiv-motorischer Spiele trainiert. Die Teilnehmer trainierten, in dem sie die Bewegungen eines virtuellen Coachs, welche auf einem TV Bildschirm gezeigt wurden, nachahmten. Vier Sensoren an den Hand- und Fussgelenken haben die Bewegungen gemessen und lieferten Echtzeit-Rückmeldungen. Weitere Trainingsprinzipien wie Bewegungsvariabilität und Progression wurden miteinbezogen. Die Probanden in der Kontrollgruppe (N=20) führten ihre täglichen Aktivitäten weiter. Alle Teilnehmer nahmen vor und nach der Interventionsperiode an Messungen teil. Die primären Outcomes waren spatio-temporale Gangparameter während normalem Laufen und Laufen mit Doppelaufgabe, motorische Funktionen (Kraft der unteren Extremitäten und Gleichgewicht) und kognitive Funktionen (Exekutiv- und Aufmerksamkeitsfunktionen). Als sekundärer Outcome wurde die Hirnstruktur mittels Magnetresonanztomographie gemessen, um neuroplastische Effekte zu erfassen. Als statistische Analyse wird eine 2x2-ANOVA für normalverteilte Daten oder das Äquivalent für nicht-normalverteilte Daten durchgeführt mit einem Signifikanzlevel von $\alpha = 0.05$.

Resultate: Die Prä-Messungen haben im Juli und August 2018 stattgefunden. Die viermonatige Interventionsperiode geht aktuell zu Ende, wobei die Post-Messungen im November und Dezember 2018 durchgeführt werden. Mit den finalen Resultaten kann im Januar 2018 gerechnet werden.

Diskussion/Konklusion: Diese randomisierte kontrollierte Studie war eine der ersten Studien, welche die Wirksamkeit eines neu entwickelten Multikomponenten-Exergames für zu Hause auf Motorik, Kognition und Hirnstrukturen von Senioren untersucht hat. Die Resultate können die Entwicklung und Anpassungen von Multikomponenten-Trainings für zu Hause unterstützen.

Symposium:

Anti-doping in cycling

Abstract:

The fight against doping in sports is a perpetual challenge to impede athletes trying to improve their performance via forbidden methods or substances.

The tremendous physical demands of competitive cycling have led many athletes to cheat with substances enhancing their aerobic capacity.

The endemic use of EPO in the 1990's seems however very far when considering the current intelligence testing in cycling and the targeted use of the Athlete Biological Passport (ABP).

The aim of this session is to present the current trends and advancements in cycling. The approach includes analytical, physiological, sociological and organisational perspectives to provide a wide overview, present innovative data and dispel misconceptions on the current fight against doping in cycling.

Contribution 1:

The organisation of the fight against doping in cycling

Authors:

Saugy M¹, Faiss R¹

¹REDs - Recherche & Expertise dans les sciences antiDopage, Université de Lausanne

Abstract:

The World Anti-Doping Agency (WADA) was created after a doping scandal in cycling at time when the use of erythropoiesis stimulating agents was endemic.

Since then, many steps forward were taken to thwart cheaters in cycling.

The Union Cycliste Internationale (UCI) was the first International Sports Federation to introduce the EPO detection test and got the first adverse analytical finding for this substance in 2001. Later on, the Cycling Anti-Doping Foundation (CADF) was created in 2008 as a non-profit foundation under Swiss law to manage autonomously the anti-doping program on behalf of the UCI.

Since then, cycling was first to introduce the athlete biological passport and nowadays act as a model in the field for its independent governance and development of innovative antidoping testing programmes.

This presentation will focus on the current challenges of the fight against doping in cycling to present past and current developments in the organization of anti-doping in cycling.

Contribution 2:

Supporting riders through empowerment? Team based approaches to doping prevention

Authors:

Cunningham R¹, Fincoeur B¹, Ohl F¹

¹ISSUL - Institut des sciences du sport, Université de Lausanne

Abstract:

Anti-doping policy in cycling has seen major reform in recent years, but still the fault is very much placed on the individual. Given that doping in cycling used to operate very much on a cultural level, it is fair to assume that social and contextual factors be considered in anti-doping. Considering organisational risks and things such as career precariousness (a major vulnerability factor for

doping) therefore helps to avoid reductionist explanation for doping behaviour and helps to inform protective factors in supporting athletes in their profession.

Approximately 70 semi-structured interviews were carried out with riders and ancillary staff within elite cycling teams and youth academies. Questions pertaining to organisation of work, views on doping, career precariousness and additional organisational factors were explored. [1]

Themes pertaining to organisational factors and professional identity emerged. Specific risk factors for career precariousness and doping vulnerability were identified in team organisation. There were differences in perspectives between those who had been subject to the "old" culture of doping in cycling and the "new generation" including barriers to career success and what members of the teams saw as protective factors in preventing doping behaviours.

Given that anti-doping in cycling has improved yet is still subject to doping rule violations, going beyond the "law and order" helps to identify how riders and teams can be better supported in protecting riders from career precariousness, which can often preclude the pursuit of performance enhancing substances.

Contribution 3:

Physiology of doping in cycling: performance production and confounding factors

Authors:

Faiss R¹, Saugy M¹

¹REDs - Recherche & Expertise dans les sciences antiDopage, Université de Lausanne

Abstract:

The physical demands of professional cycling are tremendous. Recent studies have identified several physiological factors allowing to assess such demands. In that context of peak performance production, doping represents a common shortcut in cycling. The fight against doping in cycling is thus intense with the pertaining use of the athlete biological passport (ABP) to monitor changes in hematological parameters. The ABPs' hematological module was indeed first introduced in cycling to detect atypical changes in the athletes blood parameters.

Interestingly, doping is know to alter biomarkers of the ABP, but exercise training is also known to influence these same parameters.

In that context, confounding factors affecting performance and hematological parameters need to be assessed concomitantly for an efficient detection of doping in cycling.

This presentation will insist on the necessary dialogue between experts in cycling and anti-doping with a multidisciplinary approach to provide the adequate support for an intelligent targeting and testing in cycling.

Symposium:

A Man's World. An Intersectional History of Women, International Sport, and Governance

Abstract:

« A Man's World. An Intersectional History of Women, International Sport, and Governance » is a collective book edited by Georgia Cervin, Claire Nicolas and Gregory Quin and soon to be published at Palgrave (2019). It aims to critically analyse the contribution of women to the international organisation of sport. The panel aims at highlighting 3 chapters from Swiss scholars.

The book shows how women have been involved in national sports organisations, international sports federations, and National and International Olympic Committees. This collection of biographies reveals the multitude of positions women have held, and how they reached them : from the 'first ladies' of sport who took on social, diplomatic hosting roles beside their husbands, to the secretaries keeping international sporting institutions aloft, to the revolutionaries creating spaces for women in this traditionally masculine domain. This collection demonstrates how women have been working quietly – and not so quietly – in international sport throughout the last century.

However, these women have remained largely forgotten in the existing sport history canon. Amongst other methodological reflections of this work, we consider traditional sport history's focus on athletes to be a potentially disempowering bias, and aim to demonstrate what a more intersectional approach might look like.

Contribution 1:

From Handball Courts to Ministries, the Cousins of Côte d'Ivoire

Authors:

Nicolas C¹

¹Institut des Sciences du Sport de l'Université de Lausanne

Abstract:

Winners of the African Handball Champions League from 1981 to 1984, of the Junior Africa Cup of Nations from 1980 to 1984, and a tremendous number of Ivoirian titles, the girls from the Lycée de jeunes filles of Bouaké, led by their French trainer, took it all in the early eighties. Extending for half a decade and known as the Ivoirian economic 'miracle', the girls from the second largest city of the Ivory Coast were at the forefront of the Ivoirian academic and civil sporting movement. However, most of these athletic girls in their late teens did not come from regular Ivoirian households, mostly rural and illiterate. Most of them came from an emerging literate middle class, and some were even mistresses, daughters or nieces of ministries and businessmen.

According to the legend transcribed in the newspapers, their victories and fame allowed some of them to secure key positions within the sporting administrations in the 1990s: from Ministry of Education and Head of Sport (Sport and Leisure Ministry) to Sport teacher and Sport education inspector.

This presentation is based on newspaper analysis, archives from the Ivorian Ministry of Sports and interviews with the players and their former trainer. It aims to understand how African women secured such positions, which remained the prerogative of white male French cooperating partners until the late 1980s. This analysis will offer a brief overview of the 'France-Africa' aid sporting policies in Côte d'Ivoire before investigating the vivid, tight and long running network of the players. Finally, it investigates the gendered implications of their social positions of the Bouaké handballers, as players then civil servants.

Contribution 2:

“Looking at the back door”. Three Case Studies to Demonstrate the Significance of Women in International Sport Organizations

Authors:

Vonnard P¹, Tonnerre Q¹, Sbeti N²

¹Institut des Sciences du Sport de l'Université de Lausanne; ²History department, University of Bologna, Italia

Abstract:

Introduction: It was not until the last three decades that women reached top position in international sports organizations. However, this doesn't mean that women were absent from these institutions. In fact, before the 1980's they were present in the sport institution life as wife, daughter or secretaries and their role was not passive, but rather hidden.

Methods: This research is mainly based on documents from IOC, UEFA and CONI archives. This documentation has been crossed by some personal archives. In addition, three interviews have been conducted with former employees of UEFA: Gerhard Aigner (1969-2002) and André Vieli (1982-2014) and with Lydia Zianchi's son.

Results: This research investigates the case of two women who were actives inside the International olympic committee (IOC), Marisa Bonacossa and Lydia Zianchi, as well as Suzanne Otth who spent more than twenty years as responsible of the secretariat of Union of European football associations (UEFA). These cases are interesting because the three women were active at different time of the history of these organizations: in the interwar period for Bonacossa; 1920's to 1960's for Zianchi and 1960's to 1980's for Otth. Moreover, it is also their own position inside the bodies that is interesting to emphasize. In fact, Bonacossa was not active in the secretariat but was an important person in the international IOC leaders community because she was the wife of an Italian leader, Alberto Bonacossa. At the opposite, Zianchi and Otth were active in the secretariat and, at several occasions, have replaced the general secretary for some tasks.

Discussion/Conclusion: The aim of this paper is first to describe the personal trajectory of these women. Second to give information that could help us to better understand their role inside the IOC and UEFA. It could be seen as a first attempt for future researches on the role of women inside the international sport organizations before their official admission.

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Contribution 3:

Women in leadership position: contemporary challenges in international sport federations

Authors:

Schoch L¹, Clausen J²

¹Institut des Sciences du Sport de l'Université de Lausanne; ²Académie Internationale des Sciences et Techniques du Sport (AISTS), Lausanne

Abstract:

Introduction: In 1994, the Brighton Declaration on Women and Sport highlighted the urgent need to develop policies which help to increase the representation of women at all levels of sport, from participation to coaching to decision-making. The conference on Women and Sport in Sydney in 2010 showed that progress towards more women in key sport leadership positions had stagnated and that women's representation at the governance level remains particularly low. In response to increasing external pressure from governments and umbrella organisations such as the IOC, different initiatives have been taken by some sports organizations, including the implementation of gender quotas and coaching programs for women. Despite the increasing awareness, little is known about the influence of social practices and organizational culture on women's participation in the decision-making of international sport federations (ISF). This contribution proposes an overview of the current women's participation in the decision-making bodies of ISF.

Methods: the study first uses a quantitative approach: it gathers evidence on 28 ISFs' board composition as well as on the ISFs' leadership duo president/director general. In a second step, we have conducted an exploratory study at the International Cycling Union (UCI), consisting of 12 semi-structured interviews: six with women and six with men from different hierarchical levels (president, directors, heads/chiefs of department, managers, coordinators).

Results: Despite a positive evolution in general, women holding leadership positions in the governance of key sport organizations remains an exception. Only few ISFs achieve a critical mass of women board members (defined by a minimum of 30% women's representation). With an average of 17% of women on ISFs' boards, the situation is similar to the gender distribution on the boards of national sport federations (18%) in 21 European countries (Adriaanse, 2018). Based on these observations, we conclude that sports governance at both the international and national levels continues to be male dominated. The study further suggests that the gender orientation of a sport, the history of the federation's structuration as well as the formal gender policies implemented by the organizations impact the gender ratio at governance level. Using these findings, we conclude that female sport leaders at the international level continue to struggle in terms of overall representation and access to leadership positions. More than in other areas, prevailing stereotypes and gender hierarchies, exemplified by a gendered division of tasks, impede equal participation of women in ISFs' decision-making. At the same time, several women see gender quotas critically and advocate for a selection based on competencies.

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Symposium:

Motor imagery in competitive sports

Contribution 1:

Training der Bewegungsvorstellung (BVT) im Sport: Anwendungsformen mit Kindern, Jugendlichen und Erwachsenen

Authors:

Gubelmann H¹, Baldassarre C², Hofbauer M³,

¹Department Gesundheitswissenschaften und Technologie, ETH Zurich, Switzerland; ²Lernpraxis am Klus Park, Zurich, Switzerland; ³Hofbauer GmbH, Jegenstorf, Switzerland

Abstract:

Bewegungsvorstellung wird seit vielen Jahren im Spitzen- sowie Breitensport oder auch in der Rehabilitation eingesetzt, da in sämtlichen dieser Bereiche Verhaltensverbesserungen durch den Einsatz von Bewegungsvorstellung beschrieben wurden. So sind heute nicht nur Anpassungen bei einfachen und stark kontrollierten Laboraufgaben bekannt, sondern auch bei komplexen Bewegungen wie Anpassungen der Maximalkraft (Reiser, Busch, & Munzert, 2011).

Die beschriebenen funktionellen Verhaltensveränderungen nach Bewegungsvorstellungstraining sind nicht durch strukturelle Veränderungen in der Peripherie, sondern vor allem durch zentralnervöse Prozesse und Veränderungen zu erklären. Das Ziel des Vortrags ist daher zu erläutern, welche neuronalen Prozesse während Bewegungsvorstellung ablaufen und weshalb diese neuronale Aktivität in Verhaltensveränderungen beziehungsweise Trainingsanpassungen resultieren kann.

In der Literatur gibt es einen klaren Konsens darüber, dass Verhaltensänderungen nach Bewegungsvorstellung durch die neuronale Aktivität, die während der Bewegungsvorstellung vorliegt, erklärt werden kann. Es ist in diesem Kontext allgemein anerkannt, dass Bewegungsvorstellung in einer ähnlichen Gehirnaktivierung wie bei der realen Ausführung derselben Bewegung resultiert. Diese sogenannte «overlapping brain activation» zwischen realer und mentaler Bewegungsausführung wurde in einer Vielzahl von Studien aufgezeigt und von Jeannerod in seiner viel beachteten «neural simulation theory» zusammengefasst (Jeannerod, 2001).

Neuere Studien bestätigen und erweitern die Erkenntnisse dieser Theorie durch den Einsatz neuer oder verbesserter Messmethoden. So konnten zum Beispiel Keller et al. (2018) durch den Einsatz von Transkranieller Magnetstimulation in Kombination mit peripherer Nervenstimulation nachweisen, dass die Vorstellung ballistischer und tonischer Kontraktionen in einer aufgaben- sowie pfadspezifischen unterschweligen Aktivierung verschiedener Neurone im primärmotorischen Kortex resultiert. Neben dieser unterschweligen Aktivierung gibt es auch weitere Evidenz dafür, dass der primär-motorische Kortex während Bewegungsvorstellung aktiviert wird. So konnten beispielsweise Trampel et al. (2012) mit einem ultra-hochauflösenden MRT-Scanner nachweisen, dass die verschiedenen Schichten des primärmotorischen Kortex während einer Bewegungsvorstellung unterschiedlich stark aktiviert werden.

Das Ziel des Vortrags wird folglich sein, einen kurzen und aktuellen Überblick über die Neurophysiologie der Bewegungsvorstellung zu geben.

Contribution 2:

Neuronale Mechanismen der Bewegungsvorstellung

Authors:

Keller M¹

¹Department of Sport, Exercise and Health, University of Basel, Basel, Switzerland.

Abstract:

Bewegungsvorstellung wird seit vielen Jahren im Spitzen- sowie Breitensport oder auch in der Rehabilitation eingesetzt, da in sämtlichen dieser Bereiche Verhaltensverbesserungen durch den Einsatz von Bewegungsvorstellung beschrieben wurden. So sind heute nicht nur Anpassungen bei einfachen und stark kontrollierten Laboraufgaben bekannt, sondern auch bei komplexen Bewegungen wie Anpassungen der Maximalkraft (Reiser, Busch, & Munzert, 2011).

Die beschriebenen funktionellen Verhaltensveränderungen nach Bewegungsvorstellungstraining sind nicht durch strukturelle Veränderungen in der Peripherie, sondern vor allem durch zentralnervöse Prozesse und Veränderungen zu erklären. Das Ziel des Vortrags ist daher zu erläutern, welche neuronalen Prozesse während Bewegungsvorstellung ablaufen und weshalb diese neuronale Aktivität in Verhaltensveränderungen beziehungsweise Trainingsanpassungen resultieren kann.

In der Literatur gibt es einen klaren Konsens darüber, dass Verhaltensänderungen nach Bewegungsvorstellung durch die neuronale Aktivität, die während der Bewegungsvorstellung vorliegt, erklärt werden kann. Es ist in diesem Kontext allgemein anerkannt, dass Bewegungsvorstellung in einer ähnlichen Gehirnaktivierung wie bei der realen Ausführung derselben Bewegung resultiert. Diese sogenannte «overlapping brain activation» zwischen realer und mentaler Bewegungsausführung wurde in einer Vielzahl von Studien aufgezeigt und von Jeannerod in seiner viel beachteten «neural simulation theory» zusammengefasst (Jeannerod, 2001).

Neuere Studien bestätigen und erweitern die Erkenntnisse dieser Theorie durch den Einsatz neuer oder verbesserter Messmethoden. So konnten zum Beispiel Keller et al. (2018) durch den Einsatz von Transkranieller Magnetstimulation in Kombination mit peripherer Nervenstimulation nachweisen, dass die Vorstellung ballistischer und tonischer Kontraktionen in einer aufgaben- sowie pfadspezifischen unterschweligen Aktivierung verschiedener Neurone im primärmotorischen Kortex resultiert. Neben dieser unterschweligen Aktivierung gibt es auch weitere Evidenz dafür, dass der primär-motorische Kortex während Bewegungsvorstellung aktiviert wird. So konnten beispielsweise Trampel et al. (2012) mit einem ultra-hochauflösenden MRT-Scanner nachweisen, dass die verschiedenen Schichten des primärmotorischen Kortex während einer Bewegungsvorstellung unterschiedlich stark aktiviert werden. Das Ziel des Vortrags wird folglich sein, einen kurzen und aktuellen Überblick über die Neurophysiologie der Bewegungsvorstellung zu geben.

References:

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- Trampel, R., Bazin, P. L., Schäfer, A., Heidemann, R. M., Ivanov, D., Lohmann, G., . . . Turner, R. (2012). *Laminar-specific fingerprints of different sensorimotor areas obtained during imagined and actual finger tapping*. Paper presented at the Proceedings of the 20th Annual Meeting of ISMRM, Melbourne, Australia.

Symposium:

Sport for people with a disability

Abstract:

Political initiatives such as the United Nations Convention on the Rights of Persons with Disabilities (United Nations, 2006) or the White Paper on Sport by the European Commission (2007) aim to increase social participation of people with disabilities. Switzerland has also ratified the UN Convention. Therefore, sport for people with a disability has gained relevance during the last decade.

The aim of this symposium is to analyse and discuss various current issues of sport for disabled people. The first presentation gives an overview on conducive and hindering conditions for sports programmes in institutions for people with a disability. The second contribution explores the reciprocal impact of a career as an athlete in sport for the disabled has on gender and dis/ability identity dynamics. The third paper presents an innovative approach to analyse sport for people with a disability via the content of television in Switzerland. The final talk gives an overview on a current SNSF-project (SoPariS) on social participation of children with intellectual disability in integrative physical education settings and sports clubs.

Contribution 1:

Sport- und Bewegungsangebote in Institutionen für Menschen mit einer Behinderung.

Authors:

Klenk C¹, Nagel S²

¹Institut für Sport und Sportwissenschaft, Universität Freiburg, Deutschland; ²Universität Bern, Schweiz

Abstract:

Introduction: Mit der Ratifizierung der UN Behindertenrechtskonvention (UN-BRK) hat sich die Schweiz verpflichtet, Menschen mit einer Behinderung Zugang zu Sport und Bewegung auf allen Ebenen zu ermöglichen. In diesem Zusammenhang kommt Institutionen für Menschen mit einer Behinderung eine zentrale Rolle bei der Umsetzung zu. Allerdings sind die Zugangsvoraussetzungen im institutionellen Kontext unterschiedlich (Wicker & Breuer, 2014). Es gibt sowohl Institutionen, die über ein umfassendes Sport- und Bewegungsangebot verfügen, als auch solche mit einer schwachen Angebotsstruktur. Vor diesem Hintergrund ist das Ziel dieser Studie die Angebotsstruktur in den Institutionen und die diesbezüglichen förderlichen und hinderlichen Rahmenbedingungen zu analysieren. Mit den Befunden wird einerseits eine Bestandsaufnahme und zum anderen Steuerungsansätze der Angebotsgestaltung geliefert.

Methods: In der ersten Analysephase wurden die Leiter*innen von 70 Institutionen für Menschen mit einer Behinderung in der Deutschschweiz mittels einer Online-Befragung befragt, mit dem Ziel die Angebotsstruktur sowie den Stellenwert zu erfassen. Ausgehend von dem Stellenwert des Sports und dem Angebotsumfang liessen sich drei verschiedene Institutions-Typen identifizieren (Typ A, B, C). Mit 15 ausgewählten Institutionen (à 5 pro Typ) wurden einer zweiten Analysephase vertiefende Interviews zur Erfassung der förderlichen und hinderlichen Rahmenbedingungen durchgeführt.

Results: Die Befunde der Online-Befragung zeigen, dass die Mehrheit der Institutionen Sport- und Bewegungsangebote als wichtig bis sehr wichtig einstufen und Sport und Bewegung durchweg positive Eigenschaften zugeschrieben werden. Dementsprechend bieten auch fast alle Institutionen Sport- und Bewegungsangebote an. Diese Angebote sind meist freiwillig und finden regelmässig statt, stehen aber zum Teil nur den Institutionsbewohner*innen offen. Neben den institutionsinternen Angeboten, nimmt jede zweite Institution auch Angebote von externen Sportanbietern (z.B. lokale Sportvereine, Special Olympics, PluSport) wahr.

Die Interviewdaten verdeutlichen, dass sich bestimmte Institutionskapazitäten – Personal, Finanzen, Infrastruktur, Strategie und Kooperationen – als zentrale Rahmenbedingungen erweisen, wobei sich schwache (starke) Kapazitäten als hinderlich (förderlich) hinsichtlich des Angebotsumfangs erweisen. Erwartungsgemäss weisen Institutionen mit ausgeprägten Kapazitäten auch einen entsprechend hohen Angebotsumfang auf (Typ A, B). Umgekehrt verfügen Institutionen mit geringen Kapazitäten auch über eine schwache Angebotsstruktur (Typ C).

Discussion/Conclusion: Die Mehrheit der befragten Institutionen möchte einen Ausbau ihrer Sport- und Bewegungsangebote vornehmen, die Institutionen kommen damit der Forderung der UN-BRK nach. Diesbezüglich erhalten die Institutionen mit dieser Studie spezifisches Wissen zur Steuerung ihrer Angebotsstruktur, indem sie sich auf die Stärkung ihrer Institutionskapazitäten konzentrieren sollten.

References:

Wicker, P. & Breuer, C. (2014). Exploring the organizational capacity and organizational problems of disability sport clubs in Germany using matched pairs analysis. *Sport Management Review*, 17 (1), 23-34.

Contribution 2:

Being Dis/abled, Performing Femininity, Playing Powerchair Hockey. A life-course approach to gender and dis/ability practices

Authors:

Paccaud L¹, Marcellini A¹

¹Centre de recherche sur les parcours de vie et les inégalités, Faculté des Sciences Sociales et Politiques, Université de Lausanne, Suisse

Abstract:

The “social world” of sport is thought as an area where normative gender values are preserved and diffused. By contrast, several studies show that, whitening the “social world” of dis/ability, peoples with significant impairments are often considered as non-gendered and, therefore, face difficulties to perform femininity/masculinity. Thus, disability sport, which sits at the interface of those two social worlds, seems to be an outstanding field for studying the intersectionality between gender and dis/ability.

This research aims at understanding the extent to which the commitment to a career of Powerchair Hockey player impact gender and dis/ability identity dynamics, and vice-versa. Drawing on a life-course perspective and applying a symbolic interactionist theoretical framework, this paper presents the case study of a 22 years old woman, Angela, who has had physical impairments from an early age and who played Powerchair Hockey from age 12 to 20.

The data were collected through participant observation during trainings and competitions as well as a 5 days immersion in Angela’s life and two semi-structured interviews. We then analysed the successive “turning points” in Angela’s life-course and highlighted the social mechanisms which allow identity stabilisation and/or transformation. Our results show that Angela, through her commitment to a career of Powerchair Hockey player, experienced singular interactions, which led her to reposition herself in relation to gender and dis/ability norms.

Contribution 3:

Histoire télévisuelle des rapports sociaux à l'invalidité, au handicap et au «sport-handicap» en Suisse (1954-2018)

Authors:

Marcellini A¹, Paccaud L¹

¹Centre de recherche sur les parcours de vie et les inégalités, Faculté des Sciences Sociales et Politiques, Université de Lausanne, Suisse

Abstract:

Une interrogation montante dans les domaines académique et politique porte sur l'impact des images médiatiques dans les processus complexes d'intégration et de fragmentation sociale. Les chercheurs inscrits dans le domaine des Visual studies s'intéressent ainsi de plus en plus à l'analyse des messages explicites et implicites diffusés par les flux télévisuels et à leurs conditions de production pour mieux comprendre les évolutions des rapports sociaux de domination et les processus d'intégration / désintégration sociale de différents groupes sociaux.

Notre programme de recherche s'intéresse aux contenus diffusés par la télévision publique suisse et traitant des personnes dites handicapées. Il vise à mettre au jour les discours audiovisuels sur l'invalidité et le handicap qui ont été construits et diffusés par la télévision suisse romande depuis les années 1950, et à situer et identifier l'émergence des liens entre invalidité, handicap et sport. Il s'agira de montrer comment, et au travers de quelles dynamiques de débat et de rapports de pouvoir, ces discours se sont transformés en relation avec le contexte sociopolitique et législatif suisse.

Pour cela nous proposons de constituer des corpus diversifiés de productions télévisuelles qui ont traité et traitent aujourd'hui de l'invalidité et du handicap en repérant toutes les populations associées à l'invalidité et au handicap dans ces productions. L'originalité de notre méthode repose sur la mise en lien entre d'une part un modèle contextuel de définition du handicap proposant une lecture des « situations de handicap » dans les séquences filmées, et d'autre part une appréhension des contenus télévisuels comme un monde virtuel construit comme un double, ou un reflet de la société, qui agit en retour sur la société elle-même.

La présentation des dimensions méthodologiques de ce programme de recherche portant sur les archives de la télévision suisse romande vise à encourager l'extension de celui-ci à l'ensemble des archives de la SSR via des collaborations.

Contribution 4:

Social participation of children with intellectual disabilities in integrative physical education and integrative sports clubs (SoPariS)

Authors:

Furrer V¹, Steiger A², Albrecht J², Eckhart M³, Mumenthaler F³, Schluchter T³, Valkanover S¹, Nagel S²

¹Fachdidaktikzentrum Sport, PHBern, Switzerland; ²Institute of Sport Science, University of Berne, Switzerland; ³Institute of Special Education, PHBern, Switzerland

Abstract:

Introduction: The main goal of the UN Convention on the Rights of Persons with Disabilities (UN CRPD) is social participation of all people with disabilities in society. As a result of this convention many countries, including Switzerland, exhibit a tendency towards more inclusive physical education and sports clubs. Inclusive or integrative sport, that is people with and without disability playing sport together, is considered to have high potential for fostering social participation. However, limitations and exclusion may also be more obvious in sport than in other contexts.

Current studies show that social participation in sport is particularly difficult for children and adolescents with intellectual disabilities. It becomes clear that sport can both support and foster but also restrict or even impede social participation. In Switzerland, only a small number of studies focus on integrative physical education and integrative sports clubs even though the importance of sport to foster social participation in school and leisure is widely assumed.

The goal of the present study is to gain comprehensive insight into social participation in sports. In this SNSF-project, the following research questions are addressed: (1) What is the social participation of children with intellectual disabilities in integrative physical education and integrative sports clubs? (2) Which factors are relevant to social participation in integrative physical education and integrative sports clubs? (3) Which interrelations exist between social participation in the different settings of physical education, school, sports clubs and leisure?

Methods: We follow the approach of Koster, Nakken, Pijl and van Houten (2009), who propose a heuristic framework of social participation. Their framework consists of four key aspects: (1) social contacts and interactions (2) social relationships and friendships (3) social self-perception (4) social acceptance by significant others. With respect to the influencing factors, we consider multiple variables on different levels: structural factors of school and sports clubs, individual factors of children, teachers and coaches. The project is designed as a quantitative cross-sectional study consisting of a randomized sample of approx. 150 integrative primary school classes (4 to 6 grade) with at least one child with intellectual disability (IQ < 75) and approx. 30 selected integrative teams or training groups, acquired through the pool of the school sample. For data collection purposes, standardised questionnaires are applied for children, teachers, coaches, special educational needs teachers and parents of children with intellectual disabilities. Data will be evaluated using multi-level models and structural equation models.

Discussion/Conclusion: In gaining comprehensive understanding about social participation of children with intellectual disability in sports, this project contributes to the current debate about integration and inclusion. In our contribution to the symposium, we will elaborate on the theoretical and methodological background of the study, as well as on selected findings in the preliminary study.

References:

Koster, M., Nakken, H., Pijl, S. J., & van Houten, E. (2009). Being part of the peer group: A literature study focusing on the social dimension of inclusion in education. *International Journal of Inclusive Education*, 13, 117–140. <https://doi.org/10.1080/13603110701284680>

Symposium:

La fabrique des sports nationaux : de l'importance des archives du sport suisse

Authors:

Quin G¹, Vonnard P¹, Mayencourt G¹, Cala S¹.

¹Institut des Sciences du Sport de l'Université de Lausanne, Université de Lausanne, Suisse

Abstract:

Avec une arène de plus de 50'000 places assises, la Fête fédérale de lutte suisse a en 2016 constitué un événement majeur sur la scène sportive helvétique, dans la plus grande infrastructure sportive provisoire jamais conçue. De la même manière, les organisateurs de la Fête fédérale de gymnastique de 2019 annoncent 70'000 participants, ce qui en fait le plus grand événement dans l'histoire du sport sur la scène internationale, du point de vue du nombre de participants. Ces deux exemples suffisent à décrire les singularités du panorama sportif suisse, mais le fait que cela soit pour de la lutte suisse et de la gymnastique témoigne aussi de la vigueur de traditions qui remontent au XIXe siècle. Si le football, le ski ou encore le cyclisme sont des disciplines assez classiques dans les hiérarchies sportives nationales en Occident (à la fois en termes de pratique et d'intérêt dans les opinions), et rassemblent souvent plusieurs milliers de personnes dans les stades ou sur les routes, c'est bien la Fédération Suisse de Gymnastique qui est encore la plus grande fédération sportive du pays (plus de 450'000 membres en 2017).

Dans un contexte paradoxal, où l'histoire du sport commence à s'institutionnaliser dans plusieurs Universités et hautes écoles du pays mais qui voit, dans le même temps, la principale institution muséale sportive de Suisse, à savoir le Musée du Sport Suisse de Bâle, être placée en liquidation, l'ambition de ce symposium est double. Premièrement, il s'agit de présenter les perspectives offertes par le démarrage d'un projet FNS sur l'histoire du sport suisse (« la fabrique des 'sports nationaux' », subside FNS: 100011_182399) et ainsi d'engager une discussion sur l'importance des archives du sport pour la réalisation d'une histoire plus scientifique. Dans ce cadre, il s'agit donc de mettre en scène les premiers pas du projet et notamment de souligner quels pourront être les débouchés très concrets de ce projet en termes de publications scientifiques et de vulgarisation, de promotion de l'histoire du sport et d'animation des réseaux du sport suisse.

Deuxièmement, la discussion doit aussi permettre de soulever différents enjeux comme les collaborations entre institutions universitaires et sportives dans le cadre de leur communication institutionnelle ou la mise à disposition de leur collection pour le grand public. De fait, il s'agit aussi d'ouvrir un débat sur la place de l'histoire dans la conduite d'une politique sportive au sein d'une fédération sportive nationale ou internationale et plus largement dans le cadre de l'organisation d'événements sportifs majeurs.

La table-ronde rassemble des représentants du monde du sport et de l'académie, issue de différentes régions de Suisse. (les noms sont provisoires puisque les personnes viennent d'être contactées) :

- Grégory Devaud, Député, Grand Conseil - Vaud
- Hans-Dieter Gerber, Directeur, Musée du sport suisse
- Ruedi Hediger, Directeur, Fédération Suisse de Gymnastique
- Philippe Vonnard, Chercheur FNS Senior, Université de Lausanne

Modérateur : Grégory Quin

Par ailleurs, cette table-ronde doit aussi permettre d'annoncer formellement la tenue d'une Summer school en histoire du sport, la première du genre, en septembre 2019 à l'Université de Lausanne, avec un soutien majeur de la *Société Suisse de Sciences du Sport*. Celle-ci intitulée « Doing, Writing, Thinking Sport History », sera une occasion importante de souligner la place de l'histoire du sport dans le domaine des sciences du sport, et plus largement au sein des hautes écoles.

Symposium:

Physical activity and brain health

Contribution 1:

Physical activity and brain health

Authors:

Draganski B^{1,2}, Gremeaux V^{3,4}, Lutti A^{1,2}, Kherif F^{1,2}

¹ LREN - Department of Clinical Neurosciences, CHUV - University Lausanne, Switzerland

² Neurology, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

³ Swiss Olympic Medical Center, Sport Medicine Unit, Lausanne University Hospital, Switzerland;

⁴ Institute of Sport Sciences of University of Lausanne (ISSUL), Lausanne, Switzerland

Abstract:

Introduction: Physical activity (PA) is known to have an impact on brain health. Lower PA is linked to higher morbidity and mortality. Less well characterized is the link between PA and brain anatomy, particularly in the ageing population in the context of old age-related sarcopenia. Several studies have investigated this link but primarily in small cohorts and have focused on biologically vaguely defined metrics - grey matter volume (GMV) and cortical thickness. Here, we aim to investigate the relationship between PA and brain anatomy in a large-scale general population cohort with the use of quantitative magnetic resonance imaging (MRI). We probe the relationship between PA and brain tissue properties - iron load, myelin content, free tissue water as well as GMV. We hypothesize that higher PA is reflected in neural integrity. We expect to find a positive correlation between PA and our metrics of brain health taking in account objective measures of PA, sarcopenia and obesity.

Methods: Our cohort comprised a subset of a large-scale, longitudinal study of residents of Lausanne, Switzerland - the CoLaus|PsyCoLaus study (Firman et al., 2008), from whom a wide range of demographic data, including PA indicators, were obtained. From this cohort, we acquired MRI data for 1256 individuals (mean age = 60.29 years, range = 45.98-86.7 years; 597 males, 659 females). We selected the following indices as predictor variables for our models: reported physical activity (3 levels); bio-impedance (continuous data); last known occupation (9 levels).

Neuroimaging Data: For quantitative mapping of Magnetization Transfer (MT), transverse relaxation $R2^*$ and Proton Density (PD) we acquired multiple-echo datasets with predominantly PD, MT and T1 weighting (TR/ α + 24.5 ms) at 1 mm isotropic resolution. Quantitative maps were computed in the Voxel-Based Quantification toolbox (Draganski et al., 2011) using transmit field and B0- corrected images. We used SPM12's multi-channel segmentation with MT and PD maps (Ashburner & Friston, 2005) for brain tissue classification.

Analysis: We constructed 2 separate general linear models for each PA indicator, for each set of neuroimaging data examined ($R2^*$, MT, PD* and GMV), totaling 8 models in all. For $R2^*$, MT and PD* data, we controlled for age, cardio-vascular disease and alcohol consumption. We further included an interaction term between PA and gender. GMV data were tested with the same model but further included individual total intracranial volume (TIV) as a covariate. We computed the average value for $R2^*$, MT and GMV at the whole-brain level and in individual anatomical regions as defined by a well-established atlas. GMV averages were further scaled by individual total GMV (TGM). T-tests were performed for each set of neuroimaging data ($R2^*$, PD*, MT and GMV) to determine the contribution of PA to brain anatomy, in females and males. T-statistics were deemed significant if they survived a Bonferroni, family-wise error correction for the number of regions analyzed ($\alpha = 0.05/125$).

Results:

Beyond the confirmation of ageing associated volume decrease in sensorimotor and subcortical areas we report concomitant iron and myelin loss paralleled by tissue free water increase in these very regions. Basal ganglia show a complex spatial pattern of free water decrease and iron increase

in ventral striatum contrasting the iron loss in medial thalamic nuclei. We demonstrate age-related volume and myelin loss in fronto-striatal projections additional to free tissue water decreases along the cortico-spinal tract. Preliminary findings show inversion of these age-related effects with higher level of PA.

Discussion/Conclusion: Our large-scale brain imaging study of ageing expands previous findings of investigations on volume and tissue property changes by providing robust evidence from nearly 1300 individuals from the general population. The careful adjustment of potential confounding global scaling factors confirmed the evidence coming from post mortem histology studies that ageing effects impact predominantly the motor system and physical activity counteracts this degenerative process. This allows for straightforward neuro-biological interpretation of the obtained results that calls to be further extended to longitudinal study aiming at investigation of individual trajectories over time.

Contribution 2:

Beyond physical performance : exercise for the brain

Authors:

Gremeaux V^{1,2}, Draganski B^{3,4}

¹Swiss Olympic Medical Center, Sport Medicine Unit, Lausanne University Hospital, Switzerland

²Institute of Sport Sciences of University of Lausanne (ISSUL), Lausanne, Switzerland

³LREN - Department of Clinical Neurosciences, CHUV - University Lausanne, Switzerland

⁴Neurology, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Abstract:

There are currently large evidence of the beneficial effects of regular physical exercise on cognitive function at all stages of life.

Among schoolchildren, physical activity improves school performance. Experiences of increased hours of physical activity at school have confirmed improved attention, concentration, memory, and classroom behaviours. Young people who higher physical fitness would have better academic results.

In older subjects, normal cognitive decline or "SCD" is highly variable depending on the individual and the cognitive process considered. This decline can sometimes be more rapid, although the subject has few or no complaints. This situation is referred to as "MCD" (Mild Cognitive Disorder). Among the measures that have demonstrated their effectiveness in reducing age-related cognitive performance, MCD disorders, or even Alzheimer dementia, the highest level of evidence concerns regular physical exercise. It also seems the easiest to implement, in addition to changes in eating habits, cognitive stimulation and the maintenance of social interaction.

Influence of regular physical exercise on cognitive performance decline

Several observational studies have shown that regular physical activity and sport have a protective effect on the decline in cognitive function in healthy subjects, and reduce the incidence of dementia by about 50%. There is a dose-response effect, and the level of physical ability determines some cognitive performance. Thus, the relative risk of premature cognitive decline is reduced by 35% in moderately active subjects and up to 38% in the most active. Finally, regular exercise is a fundamental element in the control of risk factors and the primary and secondary prevention of cardiovascular and cerebrovascular diseases, during which cognitive alterations are frequently found.

Effectiveness of exercise-based interventions in preventing cognitive decline

There is now clear evidence that the implementation of physical exercise programs is effective on these elements in sedentary subjects, even the elderly. This approach is particularly interesting because executive functions, which are the first to be affected during normal age-related cognitive

decline, are the processes most favourably influenced by regular physical exercise. These effects are found not only in healthy elderly subjects, with a correlation with concomitant improvement in physical abilities, but also in those with MCD.

Optimal ways to slow cognitive decline

A duration of 3 months allows to observe cognitive improvements. In addition, interval training also appears to be effective, particularly in populations at risk of accelerated cognitive decline such as patients with metabolic syndrome, in accordance with the "shear stress" theory. Although improvements in cognitive performance appear to be correlated with improvements in physical performance, significant gains can be achieved even in frail elderly subjects, however needing a complete exercise program (muscle strengthening, aerobic exercise, balance and flexibility) that is individualized and closely supervised.

What to propose in practice?

It is important to take into account the profile of individuals who are often frail. Management is individualized and involves a multiple approach in accordance with the WHO guidelines for physical activity for adults over 55 years of age. The practical difficulty lies mainly in the implementation of these programs on the field, particularly in areas of low population density where there are no networks or structures offering such supervised care.

YIA Orals

Thursday 14.02.2019

11:00 **Oral presentations 1**

G140	G120	G230
Physical activity and the brain	Physical education and motor development	Training & force

13:30 **Young Investigator Award (YIA)** G140

15:20 **Oral presentations 2**

G140	G120	G230
Gait & posture	Exercise & endurance	Psychology & lifestyle

Friday 15.02.2019

13:45 **Oral presentations 3**

G140	G120	G230
Physical activity and health	Screening & football	Mobility & governance

Title:

Santé, loisirs et architecture active : analyse croisée d'entretiens et de "traces" de déplacements auprès de collaborateurs/trices de l'administration fribourgeoise

Authors:

Aceti M¹, Basso Ricci P², Peier F¹, Kayser B³, Taube W¹

¹Unité des sciences du mouvement et du sport, Université de Fribourg; ²Bureau RBRC architectes, Fribourg; ³Institut des Sciences du Sport (ISSUL), Université de Lausanne

Abstract:

Introduction: Le bien-être au travail est un enjeu d'étude crucial tant pour les bénéfices de santé globale des employé.e.s que pour la productivité des entreprises. Diverses études ont soulevé le rôle des aménagements architecturaux pour plus de « marchabilité » et leur impact bénéfique sur l'activité physique (Kayser, 2008ab, 2005 ; Meyer et al., 2010). Le projet d'étude développé par une équipe interdisciplinaire a pour objectif d'évaluer l'impact des transformations effectuées sur le bâtiment de l'établissement cantonal des assurances sociales (ECAS) de Givisiez (FR), dans le but d'augmenter l'activité physique et le bien-être des collaborateurs/trices au travail. Le concept d'« architecture active » appliqué dans ces aménagements sera mis à l'épreuve par des mesures effectuées avant et après les transformations. L'étude a obtenu le soutien financier de l'état de Fribourg.

Méthodes: La méthodologie de recherche est mixte et enracinée dans le terrain. Les déplacements à l'aide d'accéléromètres ont été recueillis auprès de 26 personnes durant 1 semaine, ainsi que leurs traces de déplacements dans le bâtiment, dessinées par elles-mêmes. Une analyse qualitative par codage GTM sur MaxQDA a été effectuée à partir de 9 focus groups de 3-4 personnes et 6 entretiens individuels. Les perceptions et opinions de la mobilité au travail ont pu être mises à jour pour cet échantillon non représentatif de l'ensemble des usagers. S'ajoutent par conséquent des données comptabilisées mensuellement à l'aide de barrières lumineuses placées sur les 4-6 étages du bâtiment permettant de relever l'utilisation des escaliers par rapport aux ascenseurs durant toute la durée de l'étude. Des sources secondaires complètent les données, telles que le % de présentisme au travail.

Résultats: Les résultats concernent la phase d'évaluation de la situation avant les transformations qui sont en cours actuellement. Dans l'ensemble, les journées ordinaires des collaborateurs/trices se caractérisent par un taux de sédentarité élevé (accélérométrie et interviews). Si certain.e.s répondant.e.s s'adonnent à des loisirs sportifs lors de la pause de midi, après le travail ou en week-end, la plupart sont occupés par des activités de maintenance (cuisine, jardinage, nettoyage, etc.) ou de gestion domestique (soin et éducation des enfants) de faible intensité. De plus, les déplacements pour se rendre au travail sont majoritairement effectués en véhicules motorisés afin de gagner du temps dans la journée.

Discussion/Conclusion: Au vu de cette situation de départ, la contribution de ce programme de recherche vise à évaluer les effets des aménagements dans une perspective d'architecture active, afin d'apporter des connaissances scientifiques probantes et innovantes sur la marchabilité et le bien-être au travail.

References:

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Title:

Chronic effects of resistance training on heart rate variability: a systematic review

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Abstract:

Introduction: The analysis of heart rate variability (HRV) provides an indirect evaluation of the heart control by the autonomic nervous system (ANS), and was highlighted as a theoretical promising tool to monitor response to exercise, and differentiate normal fatigue in response to training from overtraining onset. The purpose of this study was to review current literature dealing with chronic effects of resistance training on HRV in healthy subjects or athletes, and thus its potential usefulness in monitoring fatigue states induced by this type of exercise.

Methods: We conducted a systematic review of the literature using PRISMA methodology in medical database PubMed (Shamseer et al., 2015). All abstracts were read by two readers, and a third reader was called upon when necessary. The selected article were read and the review scale was followed and validated by consensus from the three readers. Each article was classified according to its level of scientific evidence (LE). Articles that met all of the selection criteria were selected if they described an intervention with resistance training > 4 weeks.

Results: 8 out of 109 articles were included after selection process was administered. Main outcomes were analyzed and summarized.

Discussion/Conclusion: Results were heterogeneous and no clear chronic effects of resistance training were highlighted. No consensus were found regarding the methods of HRV metrics acquisition (primary outcome, position, length,...) and the type of population (level, sex). Resistance training does not seem to trigger specific adaptation vs aerobic training in elite athlete, in older women and in young sedentary men. However, an increased tonus in low frequencies was observed after a 12-weeks resistance training program in older healthy men. Whereas acute effects of resistance training are well documented, results were scarce and inconsistent when dealing with long-term effects. Considering the importance of the quality of measurement and the various types of outcomes (Bourdillon et al. 2017, Shaffer et al. 2017), chronic effects of resistance training on HRV remain debated and further research are needed.

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Title:

Short-term motivational and informational effects of augmented feedback during maximal isometric contractions

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Abstract:

Introduction: It was previously demonstrated that augmented feedback (AF) has a positive influence on motor performance in the short and long-term (Keller, Lauber, Gehring, Leukel, & Taube, 2014). It is assumed that AF can affect motor performance at least in two ways: a) by enhancing the motivation of the participant and/or b) by providing the participant useful information about the execution of the motor task (Salmoni, Schmidt, & Walter, 1984). Therefore, we supposed that AF-induced performance increments that primarily relied on motivation should also occur when providing false manipulated AF (MAF). In contrast, performance increments that rely on guidance towards the right execution should only occur when AF is correct. We further hypothesized that the informational content of AF is more important in motor learning tasks while motivational aspects dominate in non-learning tasks. Thus, we applied two different forms of feedback (proper AF and MAF) during maximal voluntary contractions (MVC; non-learning task) and during maximal explosive contractions (MEC; learning task) of thigh muscles.

Methods: A total of 32 participants were allocated in either the AF or the MAF-group. Each participant performed a MVC session and a MEC session on two different days. Both sessions started with a *neutral condition* (NE; without any feedback), followed by a *feedback condition* (FB). The peak torque was measured for each MVC, while the peak rate of force development (RFD) was calculated for each MEC. During FB, the absolute result of the executed contraction and the percentage difference with respect to the previous contraction was displayed on a screen, the percentage difference being either the correct difference (AF-group) or the opposite difference (MAF-group). Thus, while the motivational aspect was the same for both groups, the informational aspect was only appropriate for the AF-group.

Results: MEC: a mixed design ANOVA revealed a significant interaction effect of *GROUP* x *CONDITION* ($F_{(1, 30)} = 6.68, p = 0.015, \eta^2 = 0.003$) demonstrating that AF had a positive influence on peak RFD while MAF had a negative influence on RFD. MVC: there was a significant main effect of *CONDITION* (NE vs FB) ($F_{(1, 26)} = 7.99, p = 0.009, \eta^2 = 0.002$) indicating that the peak torque was different between NE and FB. However, no *GROUP* x *CONDITION* effect ($F_{(1, 30)} = 0.53, p = 0.472, \eta^2 < 0.001$) was found, suggesting that both groups similarly improved with AF and MAF.

Discussion/Conclusion: As AF and MAF positively influenced motor output during MVCs to a similar extent, it might be assumed that mainly motivational aspects were responsible for the improvement in this non-learning task. In contrast, during MECs, AF and MAF exerted opposing effects on motor performance proposing a strong dependency on the informational aspect. When generalizing these results, it might be speculated that motivational aspects of AF are prominent when performing non-learning (maximal strength) tasks whereas informational aspects are more important in learning tasks such as explosive contractions.

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Title:

The effects of an acute bout of exercise on neural activity in alcohol and cocaine craving: preliminary results

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Abstract:

Introduction: Numerous studies suggest that exercise may be an effective adjunct treatment for substance use disorders. It has been suggested that exercise-induced improvements in inhibitory control may reduce craving for the substance of abuse. However, this potential mechanism has seldom been researched. The aim of this study is to investigate whether acute exercise bouts at different intensities influence inhibitory control and craving for alcohol or cocaine.

Methods: The study is a crossover randomised controlled trial. Participants will be recruited from inpatient and outpatient psychiatric treatment centres, on the approval of their treating physician. A healthy control group will be recruited using online advertising. All participants will undergo each of three conditions in a randomised order; 1) 20 minutes of cycle ergometry at 50-60% of maximum heart rate; 2) 20 minutes of exercise at 70-80% of maximum heart rate; 3) 20 minutes of quiet reading. Immediately before and after each condition, participants will be asked to complete a computerised Stroop test, watch a film containing substance-related images, and self-report craving levels. During the Stroop test and film viewing, participants' neural activity will be measured via functional near-infrared spectroscopy.

Results: Results from 8 cocaine and alcohol dependent participants will be presented. The primary outcome measures are self-reported craving, inhibitory control, cerebral hemodynamic response to the Stroop test and a substance-related film.

Discussion: To date, there is evidence that exercise can reduce craving for substances, most notable nicotine, but the effects on other drugs, the role of exercise intensity, and the relevance of inhibitory control have not been assessed. These preliminary results aim to address these outstanding questions.

Title:

Skeletal muscle adaptations to sprint interval training in hypoxia: the role of the ryanodine receptor type-1 and Ca²⁺ handling

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Abstract:

Introduction

Exercise capacity is an important predictor of all-cause mortality [1]. Sprint interval training (SIT), brief bursts of “all out” exercise interspaced by periods of recovery, can induce similar or greater improvements in exercise capacity compared with moderate-intensity continuous training (MICT) despite a ~90% lower training volume [2]. This enhanced exercise capacity is due in part to increases in skeletal muscle mitochondrial content (i.e mitochondrial biogenesis) and respiratory function [3]. One potential trigger of these adaptations to SIT is calcium (Ca²⁺), a signal that increases skeletal muscle mitochondrial biogenesis [4, 5].

The main source of cytoplasmic Ca²⁺ increase in skeletal muscle during contraction is Ca²⁺ released from the sarcoplasmic reticulum (SR) via the ryanodine receptor type-1 (RyR1) channel [6]. Among various modulators of RyR1 function, calstabin stabilizes the channel in a closed state. Upon RyR1 modification (oxidation, nitrosylation or phosphorylation) calstabin can dissociate from the complex leading to a “leaky” channel (i.e Ca²⁺ efflux from the SR through the RyR1 under resting conditions [7]). A “leaky” RyR1 is associated with fatigue after strenuous endurance training [8] and, a single-bout of SIT leads to modifications of the RyR1 and increases post-exercise cytoplasmic Ca²⁺ [4].

Compared with normoxia, a single 30-s sprint performed in hypoxia has been shown to alter skeletal muscle metabolism and increase oxidative stress [9, 10]. Given that many of the post-translational modifications to the RyR1 are influenced by redox status (i.e reactive oxygen and nitrogen species [7]), it seems intuitive to propose that a bout of exercise that induces a greater oxidative stress would induce greater RyR1 modifications and, in turn, greater cytoplasmic Ca²⁺-induced increases in oxidative capacity.

The primary aim of this study was to determine the response of skeletal muscle to a single-bout of SIT in hypoxia vs. normoxia. We hypothesized that RyR1 modifications and increases in mitochondrial protein content triggered by a single-bout of SIT in normoxia would be enhanced by performing the exercise in hypoxia.

Methods

In a parallel study-design, 16 healthy recreationally active men took part in one experimental trial. Knee extensor neuromuscular function was assessed and vastus lateralis skeletal muscle biopsies were collected, before (Pre), immediately post- (Post) and 24h post (+24h) a session of SIT performed in normoxia (SIT Normoxia; fraction of inspired oxygen (FiO₂) = 21%; Vo_{2peak} = 53 ± 5 ml kg⁻¹ min⁻¹; n = 8) or hypoxia (SIT Hypoxia; FiO₂ = 15%; Vo_{2peak} = 53 ± 9 ml kg⁻¹ min⁻¹; n = 8). The sprint interval training session consisted of a standardized warm-up (5-min at 100W) followed by 6 x 30-s “all-out” cycling bouts at 0.7 Nm/kg body weight on a cycle ergometer, with 4-min rest between bouts (Place et al, 2015).

Neuromuscular function assessments involved maximal voluntary contractions (MVCs) with the knee extensors followed by paired femoral nerve stimulations at 100 Hz (PS100) and 10 Hz (PS10). MVC force was quantified to assess global fatigue and ratio between PS10 and PS100-evoked forces (PS10:PS100) was used to evaluate peripheral fatigue.

Skeletal muscle biopsies were obtained from separate incision sites from the lateral portion of the vastus lateralis muscle under local anesthesia, immediately frozen in liquid nitrogen and stored at -80°C for later analysis. Briefly, frozen samples were homogenized in an ice-cold lysis buffer. Protein content of each lysate was quantified by the Bradford colorimetric assay. Whole muscle lysates, 10 - 20 µg per well, were resolved on 15 - 4 % SDS-Page gels and transferred onto methanol-activated PVDF membranes. Blots were probed with anti-RyR1, anti-P-RyR1, anti-Total OxPhos and anti-

glyceraldehyde-3-phosphate dehydrogenase (GAPDH). Detection with secondary antibodies was performed using the Odyssey infrared image system (LiCor). Protein levels were normalized to a GAPDH control for each sample. P-RyR1 was normalized to total RyR1 levels. Data were analysed using repeated measures ANOVA with time as a within-factor and group as a between-factor. Statistical significance was set at $p < 0.05$. Data in text are raw values or expressed as % change from Pre, and presented as mean \pm SD.

Results

There were no differences in the work performed during the 6 sprints between groups (Normoxia group = 1.2 ± 0.2 kJ kg⁻¹; Hypoxia group 1.3 ± 0.2 ; $p > 0.05$).

There was a significant reduction post-exercise in MVC force (-33 ± 14 %; $p < 0.0001$), PS10:PS100 (-56 ± 12 %; $p < 0.0001$) with no significant differences between the groups ($p > 0.05$).

Neuromuscular function recovered to Pre-levels at +24 h.

Muscle protein content of RyR1 was not different at any time-point ($p > 0.05$). There was a strong tendency of increased P-RyR1/RyR1 after the sprints in normoxia but not hypoxia (SIT Normoxia = 204 ± 255 %; SIT Hypoxia = -19 ± 127 %; not significant). This was accompanied by an increase at +24h in respiratory chain complex I (SIT Normoxia = 44 ± 39 %; SIT Hypoxia = -5 ± 32 %; $p = 0.014$), complex II (SIT Normoxia = 68 ± 43 %; SIT Hypoxia = -23 ± 37 %; $p < 0.001$) and complex IV (SIT Normoxia = 42 ± 44 %; SIT Hypoxia = -22 ± 16 %; $p = 0.0014$) in the SIT Normoxia group compared with the SIT hypoxia group.

Discussion

Despite no differences in the work performed nor in the alterations in neuromuscular function after SIT in normoxia and hypoxia, performing the exercise in hypoxia blunted increases in the content of proteins involved in oxidative phosphorylation. Our results showing SIT in normoxia increases mitochondrial protein content are in accordance with previous published studies [2]. However, contrary to our hypothesis, SIT in hypoxia did not enhance these adaptations. One potential explanation for the divergent skeletal muscle responses between hypoxia and normoxia in the present study may be the modifications to the RyR1. We propose that phosphorylation of the channel after exercise in normoxia leads the RyR1 channel becoming "leaky", which in turn elevates cytoplasmic Ca²⁺ and triggers mitochondrial biogenesis, whereas hypoxia blunted these modifications, preventing the Ca²⁺ leak and thus mitochondrial biogenesis. We conclude that SIT performed in hypoxia blunts the training-induced mitochondrial adaptations. Our data support the concept that RyR1 modifications are important for skeletal muscle adaptations to SIT [4], however, this remains to be tested more mechanistically.

Future research

We have developed an in vitro model to gain additional insights into the mechanisms underpinning skeletal muscle adaptations to SIT. Experiments whereby myotubes in normoxic, hypoxic and hyperoxic environments are electrically stimulated to contract using a sprint interval exercise mimicking protocol are in progress.

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Title:

Heart Rate Variability of Older Adults is Related to Cognitive, Gait, and Physical Performance and can be Improved by Exergame Training

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Abstract:

Introduction: Heart rate variability (HRV) is associated with cognitive and physical functioning in older adults (Albinet, Boucard, Bouquet, & Audiffren, 2010). Therefore, HRV indices might serve as proxy measures or prognostic tools to assess cognitive and physical health. Cognitive-motor training improves cognitive executive functions (Eggenberger, Schumacher, Angst, Theill, & de Bruin, 2015) which are related to HRV, mediated by the prefrontal cortex brain area (Yoo et al., 2018). However, adaptations of HRV indices to simultaneous cognitive-motor training have not yet been investigated.

Methods: Eighty-nine healthy older adults (age ≥ 70 y) were randomly assigned to three different multi-component training programs: 1) virtual reality video game dancing (DANCE), 2) treadmill walking with simultaneous verbal memory training (MEMORY), or 3) treadmill walking (PHYS). Participants trained twice a week for 1 h over 6 months. At baseline, after 3 and 6 months 5-min resting HRV indices (SDNN, RMSSD, and HF-power), cognitive, gait, and physical performances were measured. Multiple regression analyses were carried out to assess performance relations with HRV at baseline and to assess training impact on HRV indices.

Results: Seventy participants completed the 6-month training. Cross-sectional analyses of baseline data resulted in regression models explaining 17% of variance in global HRV (SDNN: $p=.031$, $R^2=0.171$), RMSSD ($p=.016$, $R^2=0.169$), and HF-power ($p=.028$, $R^2=0.174$), with the most important predictors being executive function, leg strength, spatial gait variability, and verbal memory. Longitudinal analyses of training effects demonstrated a significant linear interaction in the first contrast, i.e. DANCE/MEMORY vs. PHYS, in SDNN ($F[1, 134] = 5.00$, $p=.014$ one-tailed, $\Delta R^2=0.02$) in favor of DANCE/MEMORY and a significant linear interaction in the second contrast, i.e. DANCE vs. MEMORY, in SDNN ($F[1, 134] = 8.69$, $p=.002$ one-tailed, $\Delta R^2=0.035$), RMSSD ($F[1, 134] = 4.63$, $p=.017$ one-tailed, $\Delta R^2=0.012$), and HF-power ($F[1, 134] = 5.47$, $p=.011$ one-tailed, $\Delta R^2=0.013$) representing improved HRV in DANCE and no change in MEMORY.

Discussion/Conclusion: This study provides novel insight in the associations of HRV with combined measures of cognitive, gait, and physical performance. Furthermore, the potential of exergame training (DANCE) to improve HRV is demonstrated. Hence, regular measurements of HRV indices might be valuable for the assessment of cognitive and physical health, as well as related performance improvements in older adults.

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Title:

Interference of balance tasks revisited: learning of non-postural tasks seems to impair consolidation of balance tasks

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Abstract:

Introduction: It is well-documented that a simple motor learning tasks can disrupt consolidation of another motor task and therefore lead to interference (Brashers-Krug, Shadmehr, & Bizzi, 1996; Lundbye-Jensen, Petersen, Rothwell, & Nielsen, 2011). However, Giboin and colleagues (2018) tested recently the interference paradigm in two consecutive balance tasks and reported no interference. However, it remains unclear whether non-postural tasks like visuomotor tracking or an explosive force task can impair consolidation of a previously learned balance task.

Methods: 40 healthy young adults (25 women, 15 men) were randomly assigned to one of two intervention groups. For the balance training, all subjects were standing on a custom-made “seesaw” balance device that moved in the anterior-posterior direction (6 series of 8 trials of 8 s). Immediately after the learning phase, subjects performed either a visuomotor tracking task (6 series of 8 trials of 8 s) or a rate of force development task (6 series of 8 trials). Both tasks were executed isometrically on the isokinetic device while contracting the calf muscle. On the following day, all subjects performed a retention test on the balance device (3 series of 8 trials of 8 s) after a short period of re-familiarization (6 trials of 8 s).

Results: Subjects improved their performance significantly when learning balance ($F_{1,38} = 32.987$; $p < .001$; $n^2_p = .465$), visuomotor tracking ($t_{19} = 6.953$; $p < .001$; $r = .85$) or ballistic contractions ($t_{19} = -5.885$; $p < .001$; $r = .80$). More importantly, the performance on the balance device decreased significantly from the last series of the training phase to the first series of the retention test ($F_{1,32} = 12.045$; $p = .002$; $n^2_p = .273$). No main effect for GROUP and no interaction (GROUP x TIME) were observed.

Discussion/Conclusion: The performance improvements in balancing, visuomotor tracking and ballistic contractions indicate that learning has occurred in all three tasks. Most noteworthy, the performance on the balance device was significantly decreased at the beginning of the retention test, which probably indicates interference. However, as the results of a control group, performing no interference task after balance training, are not analyzed yet, the decrease in performance may theoretically also be caused by the normal decline of motor memory over time. It seems reasonable to assume that this effect is, however, much less pronounced without an interference task. In this sense, the current results imply that typical interference tasks like visuomotor tracking or ballistic contractions impair balance performance and should not be performed shortly after balance training.

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Title:

Physical fitness and cognitive function in an ageing population: Results from a cross-sectional and randomized controlled trial

Authors:

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Abstract:

Introduction: In a society characterized by demographic change, an increasing prevalence of cardiovascular (CV) disease and cognitive decline are evident and represent an enormous socio-economic burden. Both conditions are thought to be interrelated. The aim of the study was to analyze the role of physical fitness level and short-term high-intensity interval training (HIIT) on cognitive function in older active and sedentary adults with and without CV risk.

Methods: Our study combined a cross-sectional and an interventional approach. Thirty-eight healthy active (HA; 17 women; age = 60 (SD 7) y; VO₂peak = 42.5 (8.3) mL/min/kg), 36 healthy sedentary (HS; 26 women; age = 60 (SD 7) y; VO₂peak = 29.9 (4.3) mL/min/kg) and 84 sedentary adults with increased CV risk (SR; 42 women; age = 59 (SD 6) y; VO₂peak = 26.0 (4.3) mL/min/kg) were enrolled in the cross-sectional study part. All participants underwent a medical examination including a ramp test on a treadmill for determination of VO₂peak and maximal heart rate. On a separate visit, participants conducted cognitive assessments. The Flanker task was used to measure inhibitory control of attention. The digit span task was applied as a measure of working memory. We further assessed verbal memory, the 5-point test for figural fluency function as well as the Mini-Mental State Examination (MMSE). The baseline test of the SR group served as pre-test for the following intervention. SR participants were randomized to take part in a 12-week HIIT (N = 40; 4x4 min Nordic Walking at 90-95% of maximal heart rate; 3 supervised sessions per week) or a control condition (CON; N = 34; general lifestyle recommendations). All baseline assessments were repeated after the intervention period.

Results: None of the participants, showed signs of mild cognitive impairment or dementia at baseline as indicated by the MMSE score. In the cross-sectional analysis, we found a gradual decrease in cognitive performance for HS and SR relative to HA as the active and healthy reference group. Interestingly, inhibitory control (-6% [90% confidence interval -11%,-1%]), figural fluency (-12% [-21%,-3%]) and verbal memory (-8% [-15%,-3%]) were reduced in SR compared to HA. During the 12-week intervention part, VO₂peak increased in HIIT by 9%, whereas it decreased in CON by 4%. We found no notable between-group differences in the change scores of any cognitive performance indicator as a result of training.

Discussion/Conclusion: Our results show that a high physical activity level is associated with improved cognitive performance. Clinically manifest cognitive impairments were not present at baseline, although cardiorespiratory fitness differed considerably between the active reference group and the sedentary healthy and diseased populations. Although differences in cognitive performance were apparent and likely result from long-term physical activity, 12 weeks of HIIT appeared to be too short to induce notable improvements in cognitive performance in older patients with CV risk.

Title:

Motives and goals in exercise and sport from a person-oriented perspective: How do adolescents and young adults differ concerning their profiles?

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Abstract:

Introduction

Adolescence and young adulthood are critical phases in life for shaping future exercise and sport behavior (Corder et al., 2017). So far, interventions to promote exercise and sport among adolescents and young adults have rarely systematically focused on motives and goals, although they are important for well-being and maintenance of exercise and sport behavior (Gunnell, Crocker, Mack, Wilson, & Zumbo, 2014).

Exercise- and sport-related motives and goals are mentioned when individuals offering a subjective explanation of their own exercise and sport behavior (Schmid, Gut, Conzelmann, & Sudeck, 2018). Individuals often strive for multiple motives and goals, such as to compete against others and to distract themselves from daily problems. Furthermore, motives and goals can vary concerning their degree of exercise- and sport-related self-concordance (extrinsic to intrinsic motivation) and their association to exercise and sport behavior (Sebire, Standage, & Vansteenkiste, 2011). For example, people with intrinsic motives and goals are likely to be more active.

Research (e.g., Sebire et al., 2011) have typically investigated the effect of single motives or goals on a global level across a whole population neglecting that individuals might pursue different combinations of goals. Few studies (Lindwall, Weman-Josefsson, Sebire, & Standage, 2016; Sudeck, Lehnert, & Conzelmann, 2011) have taken a person-oriented approach which assumes that there are different motive and goal patterns or profiles within a population. The person-oriented approach (Bergman & Lundh, 2015) focuses on the interaction of motives and goals within an individual that allows typical patterns or profiles to be identified. Furthermore, a person-oriented approach can help to categorize people based on their motives and goals and, consequently, as a result, develop target-group-specific interventions (Sudeck et al., 2011).

Current person-oriented studies in exercise- and sport-related motives and goals have not focused on adolescents and young adults, since they have either considered people in middle adulthood (Sudeck et al., 2011) or have not focused on specific age groups at all (Lindwall et al., 2016).

However, based on a developmental-psychological perspective (Feldman, 2014), it can be assumed that adolescents aged from 14 to 19 years and young adults aged from 20 to 34 years might have different motive and goal profiles.

Therefore, this person-oriented study examines which motive and goal profiles for adolescents and for young adults can be identified and how these profiles might differ across the age groups quantitatively (number of profiles) and qualitatively (goal characteristics). Furthermore, to validate the profiles found, their association with self-concordance as well as exercise and sport behavior was investigated.

Methods

A cross-sectional design with 1582 adolescents and young adults (Mage = 19.8 years, SDage = 4.5 years, range = 14-34 years; 59.8% female) was applied. The sample was recruited from public schools, universities and service companies.

Eight exercise- and sport-related motives and goals ($.79 \leq \alpha \leq .91$; Gut, Schmid, Schmid, & Conzelmann, 2018) were measured by questionnaire. The goal profiles were validated by assessing the sport- and exercise-related self-concordance (Seelig & Fuchs, 2006) as well as exercise and sport behavior (Fuchs, Klaperski, Gerber, & Seelig, 2015).

To identify motive and goal profiles, latent profile analysis (LPA; Morin, Meyer, Creusier, & Biétry, 2016) in Mplus was conducted using the intra-individual z-values of the eight motives and goals. LPA is a probability-based method that allows the model fit to be tested considering statistical indicators: log likelihood value, Bayesian information criterion (BIC), entropy, and bootstrapped

likelihood ratio test (BLRT). However, theoretical indicators, such as the principle of parsimony, theoretical considerations and the interpretability of the identified profiles, are ultimately decisive for the optimal number of profiles. To compare the number of profiles across adolescents and young adults, multiple-group-analysis of configural similarity (measurement invariance) was conducted following the procedure of Morin et al. (2016). To validate the identified profiles, sport and exercise behavior (categorical: inactive, active from 1 to 74 min per week, active \geq 75 min per week) and self-concordance were compared across all profiles using Wald chi-square equality tests. This procedure considers profile membership probability within the analyses.

Results

Five profiles among adolescents as well as five profiles among young adults were identified. However, the profiles between these two age groups differed substantially: The profiles of adolescents were labelled as Purpose-free sport enthusiasts ($n = 113$, 11.9%), Sensation seekers ($n = 84$, 8.9%), Health- and figure-oriented sport persons ($n = 436$, 46.0%), Contact-friendly athletes ($n = 199$, 21.0%) and Aesthetes ($n = 116$, 12.2%). In contrast, the profiles of young adults were labelled as Health- and figure-oriented sport persons ($n = 266$, 42.3%), Distraction-seeking competitors ($n = 91$, 14.5%), Purpose-free sport enthusiasts ($n = 71$, 11.3%), Health-oriented aesthetes ($n = 123$, 19.6%), and Health-oriented stress regulators ($n = 78$, 12.4%). As expected, the profiles found differed in the degree of self-concordance ($\chi^2 = 139.26$, $df = 4$, $p < .001$ for adolescents and $\chi^2 = 93.27$, $df = 4$, $p < .001$ for young adults, respectively) as well as exercise and sport behavior ($\chi^2 = 74.63$, $df = 4$, $p < .001$ for adolescents and $\chi^2 = 100.31$, $df = 4$, $p < .001$ for young adults, respectively).

Discussion/Conclusion

This is the first study to investigate motive and goal profiles in adolescents and young adults. Results show that there are both age-specific and age-unspecific profiles. The age-specific profiles found can be linked to age-specific development tasks (Feldman, 2014): For example, adolescents in the Sensation seekers-profile want to explore new challenging situations within exercise and sport that can be seen as part of the identity development of adolescence (Feldman, 2014). Young adults in the Health-oriented stress regulators-profile are characterized by a high need to do something for their health and to reduce stress, whereby exercise and sport can be seen as a relaxation tool to keep a balance between work and life. Furthermore, the results indicate that certain motive and goal profiles, e.g., Purpose-free sport enthusiasts, are more favorable than others because people with these profiles pursue more self-concordant motives and goals as well as are more active.

The motive and goal profiles provide a knowledge base to design target-group-specific interventions in health and leisure sport (e.g., individual sport counseling) that can be seen as a useful complement to interventions targeted only on objective needs (e.g., diseases or physical deficits). A next step would be to develop such interventions by specifying the content in terms of activities and its design (Sudeck & Conzelmann, 2011). Furthermore, the long-term effect of these interventions on maintenance of exercise and sport behavior should be investigated. As a potential mechanism it could be assumed that self-concordance mediates the relationship between motives and goal profiles as well as exercise and sport behavior (Sebire et al., 2011). In addition, research should investigate the stability and modifiability of profiles.

In conclusion, pursuing a person-oriented approach in exercise and sport promotion seems to be a promising way for both research and practice: Researchers are better able to understand interactions of different motives and goals within an individual, whereas practitioners can use motive and goal profiles as a tool to conceive sport programs.

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Title:

Lernen und Lehren en éducation physique et sportive (LELEPS)

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Abstract:

Das projektbezogene Netzwerk der acht Hochschulen HEP BEJUNE, HEP/PH Fribourg, PH Luzern, PH St. Gallen, IFUE Genf, PH Zürich, HEP Vaud und der PHBern hat mit Unterstützung von swissuniversities das Entwicklungsprojekt LELEPS initiiert. Die sprach- und schulstufenübergreifende Aufarbeitung fachdidaktischer Grundlagen für den Schulsport Schweiz zielt auf die Weiterentwicklung und Koordination einer wissenschaftsgestützten sowie auf das Schulfach Bewegung und Sport ausgerichteten Lehrerinnen- und Lehrerausbildung ab. Die Zielperspektive des Projekts LELEPS ist die Etablierung der fachdidaktischen Kompetenzen auf nationaler Ebene sowie die Nutzung der fachdidaktischen Kompetenzen für die Forschung und Lehre der Fachdidaktik. Auf der Basis theoretischer und empirischer Expertise soll der fachdidaktische Diskurs unter Fachkräften (sportunterrichtende Lehrpersonen, Didaktiker/-innen, Sport- und Bewegungswissenschaftler/-innen) aller Bildungsstufen entwickelt sowie die generelle Konzeption „Schulsport Schweiz“ bzw. des Lehrens und Lernens im Schulsport fachdidaktisch erarbeitet werden.

Im Rahmen dieses vierjährigen Projekts werden auf nationaler Ebene übergreifende fachdidaktische Kernaspekte des Schulsports wissenschaftlich fundiert und praxisorientiert diskutiert. Damit einhergehend werden verschiedene Lehrpläne der Sprachregionen in der Schweiz (LP21, PER) sowie aktuelle Entwicklungen anderer Lehrmittel mitberücksichtigt. Unter Berücksichtigung allgemeindidaktischer, sportdidaktischer, erziehungs- und sportwissenschaftlicher Perspektiven werden zentrale Aspekte des Lehrens und Lernens im Sportunterricht definiert, mit dem Ziel Grundlagentools für die Ausbildung angehender Bewegungs- und Sportlehrpersonen zu erarbeiten. Zudem wird parallel auf der Grundlage von pädagogischen und didaktischen Konzepten ein empirisches Forschungsprojekt zum Professionswissen von Dozierenden Fachdidaktik Sport in der Schweiz durchgeführt.

Huit hautes écoles suisses organisées en réseau (HEP BEJUNE, HEP/PH Fribourg, PH Luzern, PH St. Gallen, IUFE Genève, PH Zürich, HEP Vaud et PHBern) ont initié le projet de développement LELEPS, avec le soutien de swissuniversities. Le but de ce projet est de réactualiser les bases didactiques disciplinaires du sport scolaire en deux langues et pour tous les degrés, afin de favoriser le développement continu de la discipline et la coordination de la formation des professeurs en éducation physique et sportive.

Plus précisément, l'objectif du projet LELEPS est la conception sur des bases scientifiques de compétences didactiques au niveau national en vue de leur utilisation pour la recherche et la formation. Le discours didactique de l'éducation physique et du sport entre professionnels (enseignants, didacticiens, scientifiques) et la conception générale du sport scolaire en Suisse (enseignement et apprentissage) méritent en effet d'être élaborés sur des bases d'expertises théoriques et pratiques pour tous les degrés.

Dans le cadre de ce projet de quatre ans, les aspects clés de la didactique disciplinaire seront discutés. Divers programmes d'enseignement et outils pédagogiques de cette discipline dans différentes régions linguistiques (LP21, PER) seront pris en compte. Considérant les perspectives de la didactique générale, de la didactique du sport, et des sciences du sport, des concepts de l'enseignement et de l'apprentissage seront proposés. A terme, il s'agira de fournir un modèle permettant l'élaboration d'outils de référence pour la formation de futurs enseignants d'éducation physique et du sport. Parallèlement le projet intègre un volet de recherche empirique sur le savoir professionnel des didacticien/-iennes en Suisse, fondé sur la pédagogie et la didactique du sport.

Title:

The importance of norms for typical motor development

Authors:

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Abstract:

Introduction: The Zurich Neuromotor Assessment – second version (ZNA-2) describes the developmental course and inter-individual variation for timed performance and quality of movements in typically developing children from 3 to 18 years old [1]. The ZNA-2 is focusing on the general motor abilities of the child not on skills. A second advantage is that the same test items are used over the entire age period thereby enabling to really track developmental courses.

Methods: A total of 616 typically developing children between 3 and 18 years of age were enrolled from day-care centres, kindergartens and schools in Zurich, and were administered the ZNA-2. Motor proficiency was assessed with 14 different tasks allocated into five components (fine motor tasks, pure motor tasks, static balance, dynamic balance, and contralateral associated movements). Intra-observer, inter-observer and test-retest reliabilities were evaluated.

Results: Most ZNA-2 tasks featured a marked developmental trend and substantial inter-individual variability. Test-retest reliability was generally high on five domains (fine motor, 0.78; pure motor, 0.84; static balance, 0.67; dynamic balance, 0.78, contralateral associated movements, 0.81; and total score, 0.84). Intra-observer and inter-observer reliabilities were high (from 0.72 to 1.00).

Discussion/Conclusion: The development of motor abilities between 3 and 18 years of age is highly dependent on age and sex. As the ZNA-2 has no ceiling or bottom effect, it enables us to cover a large variability in motor performance. For this reason the ZNA-2 is very suitable to use as a test instrument to investigate what are the real motor abilities of the child, for better and worse. The effects of specific motor practice on test performance are very little and make the test appropriate to investigate the “basic” motor traits of a child. Only in this way we are able to determine whether a child is really talented (or not) and what are his/her basic motor competencies on the different domains.

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Kakebeeke, T. H., Knaier, E., Chaouch, A., Caflisch, J., Rousson, V., Largo, R. H., & Jenni, O. G. (2018). Neuromotor development in children. Part 4: new norms from 3 to 18 years. *Developmental Medicine and Child Neurology*. doi:10.1111/dmnc.13793

Title:

Diurnal and day-to-day variations in endurance performance in athletes

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Abstract:

Introduction: In competitive sports any substantial individual differences in diurnal variations in maximal endurance performance are highly relevant for athletes. Previous studies have exclusively focused on how the time of day affects performance (Chtourou & Souissi, 2012). Maximal individual diurnal variations in performance were thereby neglected. Thus, the aims of this study were to investigate the maximum diurnal variation in maximum oxygen uptake ($\dot{V}O_{2max}$) and to compare the amplitude of $\dot{V}O_{2max}$ during the day to the day-to-day variation in $\dot{V}O_{2max}$. The third aim was to investigate if there is a time-of-day effect on $\dot{V}O_{2max}$.

Methods: Ten male and seven female athletes (mean $\dot{V}O_{2max}$: 58.2 ± 6.9 ml/kg/min) performed six maximal cardiopulmonary exercise tests at six different times of the day to investigate the diurnal variation in $\dot{V}O_{2max}$. A seventh test was then performed at the same time the sixth test took place to investigate the day-to-day variation. The test times were 7:00, 10:00, 13:00, 16:00, 19:00, and 21:00. The order of the cardiopulmonary exercise tests was the same for all participants to ensure sufficient recovery but the time of day of the first exercise test was randomized. All tests were performed on a bicycle ergometer under standardized laboratory conditions. A verification-phase with supramaximal load (105% of maximum power output) was performed after each test to verify the $\dot{V}O_{2max}$ measured. We used paired t-tests to compare the nadir (lowest $\dot{V}O_{2max}$) and peak (highest $\dot{V}O_{2max}$) of diurnal variations and the day-to-day variations. A linear mixed effects model with post-hoc tests was used to compare $\dot{V}O_{2max}$ achieved at different times of the day.

Results: The mean difference in $\dot{V}O_{2max}$ was 5.0 ± 1.9 ml/kg/min (95% CI: 4.1, 6.0) for the diurnal variation and 2.0 ± 1.0 ml/kg/min (95% CI: 1.5, 2.5) for the day-to-day variation. The diurnal variation was significantly higher than the day-to-day variation with a mean difference of 3.0 ± 2.1 ml/kg/min (95% CI: 1.9, 4.1). The linear mixed effects model revealed no significant differences in $\dot{V}O_{2max}$ for any pairwise comparison between the different times of the day (all p-values > 0.11). This absence of a time-of-day effect is explained by the fact that peak $\dot{V}O_{2max}$ was achieved at different times of the day by different athletes.

Discussion/Conclusion: Athletes show significant diurnal variations in $\dot{V}O_{2max}$, which are more than twice as high as the day-to-day variations and therefore relevant in competitive sports. This diurnal variation in $\dot{V}O_{2max}$ even exists in the absence of a time-of-day effect. However, the results are also relevant to research. To increase signal-to-noise-ratio in intervention studies it is necessary to conduct cardiopulmonary exercise testing at the same time of the day for pre- and post-intervention exercise tests.

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Title:

The role of socioeconomic status, migration background and parental lifestyle on arterial stiffness in children: The EXAMIN YOUTH study

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Abstract:

Introduction: The socioeconomic status (SES), migration background and parental lifestyle are associated with several cardiovascular (CV) risk factors such as obesity, physical inactivity and passive smoking in children^{1–3}. The aim of the present study was to examine the influence of these social background factors on arterial stiffness as a marker of cardiovascular risk in children.

Methods: Pulse wave velocity (PWV) was recorded with a non-invasive oscillometric device in 983 children aged 6- to-8 years (51% girls). Additionally, parents completed a questionnaire about the SES, migration background and parental lifestyle.

Results: Parental smoking was associated with higher arterial stiffness in young children ($p > 0.001$). Children in the category of high household income had significantly lower PWV (4.30 Confidence interval (CI) [4.26; 4.34] m/s) compared to children in the lowest category (4.35 CI [4.32; 4.39] m/s; $p = 0.02$), but these findings were not independent of educational level. No association was found between parental educational level, migration background, parental physical activity (PA) and arterial stiffness in our cohort.

Discussion/Conclusion: Parental smoking and household income were associated with higher arterial stiffness in young children. Primary prevention and education programs are warranted to counteract vascular impairments associated with parental smoking and socioeconomic lifestyle discrepancies to establish healthy childhood development.

Title:

Effects of exercise intensity and hypoxia on endothelial function in healthy mice

Authors:

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Abstract:

Introduction

In hypoxia, the decreased inspired fraction of oxygen (O₂) leads to hypoxemia (lowered arterial pressure in hypoxia) and an altered O₂ transport capacity (Calbet et al., 2003). Acute hypoxia induces an increased sympathetic vasoconstrictor activity directed towards skeletal muscle (Hanada et al., 2003) and an opposed 'compensatory' vasodilatation (Casey & Joyner, 2012). This vasodilatation is essential to ensure an augmented blood flow and maintenance (or limit the alteration) of oxygen delivery to the active muscles.

Nitric oxide (NO) seems to be the primary endothelial source but several other vasoactive substances are likely playing a role in the compensatory vasodilatation during hypoxic exercise (Casey et al., 2010). The regulation of the NO-mediated component of the compensatory vasodilatation seems to be intensity dependent (Casey & Joyner, 2012). The low intensity hypoxic response seems to be regulated by β -adrenergic receptors, whereas other candidates could be stimulating NO release during higher intensity hypoxic exercise, such as ATP released from erythrocytes and/or endothelial derived prostaglandins. This effect on the vascular and endothelial function is promising in patients with circulatory or artery diseases.

Supramaximal exercise in hypoxia (named repeated sprint training in hypoxia, RSH, in the exercise physiology literature) is a recent training method (Girard et al., 2017) providing performance enhancement in team- or racket- sport players. This method differs from interval-training in hypoxia performed at or near maximal speed (V_{max}) since RSH performed at maximal intensity leads to a greater muscle perfusion and oxygenation and specific muscle transcriptional responses (Brocherie et al., 2018). Several mechanisms have been proposed to explain the effectiveness of RSH: during sprints in hypoxia, the compensatory vasodilatation and associated higher blood flow would benefit more to the fast-twitch fibers than the slow-twitch fibers. Consequently, RSH efficiency is likely to be fiber-type selective and intensity dependent. We speculated that the improved responsiveness of the vascular system is paramount in RSH. The translation of the benefits of this method to the clinical field is unknown.

Exercise training has been extensively studied in mice, both in healthy individuals and in pathological mouse models (Pellegrin et al., 2007; Picard et al., 2013). The most common way to train mice is using a rodent treadmill, and the traditionally used regimen is low intensity training, at 40-60% of V_{max}, determined using an incremental treadmill test (Ayachi et al., 2016), for 30-60 min (Schill et al., 2016). The interest to have mice exercising at supramaximal intensity (i.e. above the V_{max}) in hypoxia comes from previous results that the microvascular vasodilatory compensation is more increased at supramaximal than at moderate intensities. However, to our knowledge, there is no previous report of supramaximal training protocol in mice, either in normoxia or in hypoxia.

The aim of the present study was to assess the effects of two training regimens in normoxia and hypoxia on the vascular function. Therefore, we tested the hypotheses that (1) supramaximal intensity exercise in hypoxia induces larger improvement in vascular function than exercise in normoxia but also than exercise in hypoxia at a lower intensity; and (2) that this potential improvement of vascular function was occurring via an increased NOS activity.

Methods

C57BL/6 male mice performed running exercise training three times per week, over a period of four weeks at either low intensity (Low) or supramaximal intensity (Supra) training, in normoxia or hypoxia, on a motorized rodents treadmill: LowN (40min at 40% of V_{max}, FiO₂=0.21, n=10 mice), LowH (40min

at 40% of Vmax, FiO₂=0.13, n=10 mice), SupraN (4 series of 5 sprints at 150% of Vmax, FiO₂=0.21, n=10 mice) and SupraH (4 series of 5 sprints at 150% of Vmax, FiO₂=0.13, n=10 mice). Total workload was matched between groups.

At the end of the training protocols, mice were euthanized and the abdominal aorta was harvested and placed in organ chambers for vascular reactivity assessment. Vessels were pre-contracted with phenylephrine (Phe; 10-4M) and cumulative dose-response curves to the endothelium- and nitric oxide- (NO) dependent vasodilator acetylcholine (ACh; 10-9 to 10-4M) and to the endothelium-independent NO donor (DEA)/NO (10-9 to 10-4M) were performed. In order to assess the level of implication of NOS, a single dose of ACh was administered, coupled with NG-nitro-L-arginine (NLA) which is an inhibitor of NOS.

Results

SupraH improved ACh-induced relaxation compared to SupraN, with significant differences at 10-5 and 10-4M (p<0.05) and a strong tendency at 3x10-5M (p=0.06). No significant differences were observed in ACh-induced relaxation between the low intensity training groups or between the Low and Supra groups.

No significant differences were observed in (DEA)/NO- and ACh+NLA- induced relaxation between the Low and Supra groups.

Discussion/Conclusion

Supramaximal intensity exercise in hypoxia induces larger improvement in vascular function than same intensity exercise in normoxia, but not than exercise in hypoxia at lower intensities. This improvement of vascular function seems to be occurring via the NO pathway but is not regulated by NOS activity. Other candidates impacting the NO bioavailability have to be investigated such as ATP or oxidative stress (Casey & Joyner, 2012).

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Title:

Summative assessment in physical education: from curriculum to teaching practices

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Abstract:

Introduction: Summative assessment in PE occurs at the end of an activity unit to verify the learning, sometimes certify it and it is an important step in the learning process [1]. As underlined by some researchers (e.g., [2]), assessment, such as curriculum and teaching practices are central, being the three fundamental dimensions of 'quality PE'. In French speaking part of Switzerland, the official PE curriculum is common for each state, but the modality of assessment differ between states: a promotional grade in the state of Geneva, a non-promotional grade in the state of Jura, and no grade (assessment book) in the state of Vaud [3]. The purpose here is to understand the dynamics in these three states between PE curriculum (similar), PE assessment guidelines (different), and teaching practices and conceptions.

Methods: This study was based on a variety of data collection tools in secondary schools in the states of Vaud (VD), Geneva (GE) and Jura (JU) (student and teacher questionnaires and interviews, direct observations in PE classes) [3]. In all, 214 teachers fulfilled the questionnaires (VD = 130, JU = 34, GE = 50), 3967 students fulfilled the questionnaires (VD = 1'331, JU = 879, GE = 1757), 10 teachers were observed and interviewed before and after observations (3 observations by teacher, 20 interviews in all, VD = 4, JU = 3, GE = 3). Finally, 26 students were interviewed after observation (VD=8, JU = 9, GE = 9). Direct observations were used to build the interview guidelines at the end of the activity unit. Questionnaire data was analysed using statistical descriptive analyses. A thematic content analysis was used on interview data.

Results: Results showed a clear opposition in teaching practices and conceptions between PE teachers from the state of Vaud (no grade, book assessment), and from the state of Geneva (promotional grade). In the state of Geneva, PE teachers promoted motor learning in PE lessons, while in the state of Vaud, they promoted more long-term objectives, such as health, pleasure and the development of physical activity outside PE lessons.

Discussion/Conclusion: This study underlined the importance of summative assessment guidelines on teaching practices and conceptions and the dynamics that emerged between curriculum, assessment, teaching practices and conceptions in three different PE contexts with similar PE curriculum but different assessment guidelines [2]. To note, an assessment reform was recently conducted on assessment books in the state of Vaud (with an emphasize of motor learnings in PE lessons), and it would be interested in future research to estimate the development of teaching practices and conceptions in this state.

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Title:

Agility training to improve fall risk factors in community-dwelling older adults: A randomized parallel group trial

Authors:

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Abstract:

Introduction: Exercise training can effectively prevent falls and the progression of frailty. Current recommendations propose a separate training of balance, strength, endurance and flexibility even though this is highly unspecific to fall-threatening situations. A recently proposed agility-training approach, i.e. an integrative multi-component exercise intervention, combines rapid changes of movement velocity, stop-and-go patterns, cutting maneuvers and rotations as well as cognitive tasks (Donath et al., 2016). The aim of the present study was to compare the efficacy of an agility training approach to traditional strength and balance training regarding the effects on fall risk factors.

Methods: In this randomized parallel trial, we trained 27 healthy seniors (16♂; 11♀; age: 69.5 ± 5.3 y; BMI: 26.4 ± 3.7 kg/m²) for 8 weeks, with three weekly group training sessions of 45 to 60 minutes. The agility group (AG; N=12) trained following the agility framework and the control group (CG; N=15) performed traditional body weight strength and balance exercises. In both groups, the difficulty of exercises was progressively increased. Anthropometric data, static and dynamic balance, lower limb and trunk maximum strength and rate of torque development (RTD) as well as endurance was measured before and after the intervention. Multiple linear regression models were constructed with change scores as dependent variables and group, baseline performance and gender as predictors. Differences in change scores between groups are reported with 90% confidence intervals together with standardized effect sizes (d).

Results: Participants completed 91 ± 7 % of training sessions. Both groups improved endurance (AG: d=0.62, CG: d=0.45), maximum dorsal extension strength (AG: d>0.23, CG: d>0.42) and RTD (AG: d>0.14, CG: d>0.35), plantar flexion RTD (AG: d>0.72, CG: d>0.13) and Y-balance score (AG: d=0.28, CG: d=0.31). Only AG improved maximum plantar flexion strength (d>0.25) and trunk extension RTD (d=0.28). Maximum trunk flexion strength declined in both groups (d=-0.23). We found at least small between-group effects in favor of AG for endurance (Δ [90% CI]=40.2[-9;90] m; d=0.22), maximum plantar flexion strength (left: Δ =6.6[-3.0;16.2] Nm, d=0.21; right: Δ =17.4[8.2;26.5] Nm, d=0.62), plantar flexion RTD (left: Δ =10.2[0.8;19.6] Nms⁻¹, d=0.54; right: Δ =10.9[1.1;20.7] Nms⁻¹, d=0.60), and trunk extension RTD (Δ =18.3[3.7;32.8] Nms⁻¹, d=0.45). We observed small between-group effects favoring CG for maximum dorsal extension strength (left: Δ =2.9[-0.8;6.6] Nm, d=0.28; right: Δ =3.3[-0.2;6.8] Nm, d=0.35) and RTD (left: Δ =1.0 [-1.3;3.3] Nms⁻¹, d=0.17; right: Δ =1.4[-0.6;3.5] Nms⁻¹, d=0.23). Between-group differences for all other parameters were trivial.

Discussion/Conclusion: Agility based exercise training seems at least as efficacious in improving fall risk factors among community dwelling healthy seniors compared to traditional balance and strength training. The adaptations in lower leg and trunk extension power may be regarded beneficial from a fall prevention perspective. Further intervention studies are required in order to elucidate the long-term effectiveness of the agility approach.

References:

Donath, L., van Dieën, J., & Faude, O. (2016). Exercise-Based Fall Prevention in the Elderly: What About Agility? *Sports Med* 46(2), 143-149.

Title:

Long-term association of physical activity and fitness with cardiovascular risk in primary school children: The Sportcheck Follow-Up Study

Authors:

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Abstract:

Introduction: Prospective follow-up studies to assess cardiovascular health during childhood and adolescence are scarce. Prospective long-term studies are needed to prove the efficacy of primary prevention programs for healthy aging as a long-term goal. To date, Swiss schoolchildren are five times more likely to be overweight than they were fifty years ago. Sedentary lifestyle, physical inactivity and poor diet account for a steadily increasing body mass index (BMI) in childhood. Physical inactivity and associated obesity often persists into adulthood and leads to the development of cardiovascular risk factors such as hypertension, diabetes, hyperlipidemia and the development of atherosclerosis. It is essential to take primary prevention measures before manifestation of cardiovascular disease. Biomarkers of cardiovascular risk in children are poorly examined. Our study aims to analyse whether changes in physical activity and fitness during a four-year follow-up period have an impact on BMI, blood pressure and retinal vessel diameters as a microvascular biomarker of cardiovascular risk.

Methods/Design: Baseline data of this longitudinal study were collected in 2014 in a cohort of 6 to 8 year old schoolchildren (n=750). As a measure of vascular health, retinal microvascular diameters and large artery pulse wave velocity were examined. Anthropometric parameters, such as weight, height, body mass index and blood pressure were assessed according to standardized, protocols for children. A 20m shuttle run, a 20m sprint and a proxy-reported questionnaire on lifestyle behavior were applied to measure physical fitness and activity. In 2018, the children underwent the same screening procedures. A complete follow-up dataset of 250 participants was achieved.

Discussion: Long-term investigation of vascular health in two different vascular beds will help to optimize cardiovascular risk stratification in children to identify those at risk of disease progression later in life. The study will demonstrate the importance of specific cardiovascular screening programs in children to reduce the growing burden of cardiovascular disease in adulthood. The results of the study are to be implemented in primary prevention strategies of the Canton Basel Stadt to translate research into practice.

Title:

Physical performance, cardiovascular health, and psychosocial wellbeing in residential old and very old adults

Authors:

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Abstract:

Introduction: With increasing age physical activity levels decrease (Skelton, 2001). Physical inactivity leads to a reduction in general health as well as an increase of disease and injury rates in the oldest population (Rubenstein, 2006). This issue is particularly relevant in institutionalized older adults. We aimed to elucidate whether residential seniors show different levels of physical performance, cardiovascular risk and psychosocial wellbeing depending on their age in a preliminary analysis of a larger clinical trial.

Methods: Eighteen residential seniors were enrolled. Physical performance was assessed using the Short Physical Performance Battery (SPPB) consisting of balance tests, repeated chair rising test and gait analysis. Pulse wave velocity (PWV) and augmentation index (Alx@75) were obtained by an oscillometric monitor. The Falls Efficacy Scale (FES), Short Form Survey-36 (SF-36) and the Assessment of Quality of Life (AQoL-8D) were applied to assess psychosocial wellbeing. For data analysis, we divided seniors into “old” (<85 y, n=9, f: 8; age: 77 y (SD 5), range 72-84 y; BMI: 25.9 kg/m² (4.1)) and “very old” (≥85 y, n=9, f: 8; age: 91 y (5), range 86-101 y; BMI: 24.9 kg/m² (4.8)).

Results: Very old seniors had similar physical performance scores compared to old seniors (total physical parameters z-scores: very old: mean=-0.04 (SD 0.54), old: 0.06 (0.44); Δ =-0.01; 90% confidence interval [-0.37,0.35]). SPPB total scores were 8.8 (2.4) for the very old, and 8.1 (2.3) for the old with a between-group difference of Δ =0.7 [-1.0,2.4]. PWV and Alx@75 were higher in the very old seniors compared to the old (PWV: very old: 14.7 m/s (1.4), old: 11.4 m/s (1.5); Δ =3.3 [2.3;4.3]; Alx@75: very old: 35.4% (7.2), old: 27.2% (8.7); Δ =8.2 [2.4;14.2]). Quality of Life was similar in both age groups (AQoL-8D: very old: 82.7 (9.7), old: 79.1 (6.6); Δ =3.6 [-3.6,9.4]; SF-36: very old: 72.5 (20.9), old: 71.2 (15.1); Δ =1.1 [-13.1;14.4]; total psychosocial wellbeing z-scores: very old: 0.0 (0.57), old: 0.0 (0.47); Δ =0.0 [-0.48,0.39]).

Discussion: The two age groups showed no noticeable differences in either physical performance or in psychosocial wellbeing. The decline in physical performance, increase in physical limitations and the individual perception of psychosocial wellbeing seem to be determinant factors for living in a residential setting, independent of age. Cardiovascular health, however, is age-dependent, with the very old group having higher arterial stiffness indices and therefore a higher cardiovascular risk than the old group. As our analysis is based on a very small sample, these results should be regarded as preliminary.

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Title:

La gouvernance du sport en Suisse

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Abstract:

Introduction: La gouvernance du sport est actuellement un thème clé de l'organisation du sport national et international. Plusieurs ouvrages collectifs se consacrent exclusivement au thème (voir Winand and Anagnostopoulos, 2019 ou O'Boyle and Bradbury, 2013). Cela étant, aucune contribution ne s'est encore penchée sur une analyse approfondie et spécifique de la gouvernance du sport en Suisse, alors que grâce à sa tradition d'accueil des organisations sportives internationales, son fédéralisme et sa démocratie semi-directe, ainsi qu'un secteur du sport privé relativement autonome, l'objet d'analyse semble porteur. Partant, l'objectif de cette contribution consiste à décrire les caractéristiques de la gouvernance du sport en Suisse en particulier à la lumière des trois dimensions classiques de Henry and Lee (2004) : systémique, politique et organisationnelle.

Methods: Cette contribution s'appuie sur une analyse documentaire.

Results: La gouvernance du sport en Suisse s'est construite au fil du temps par plusieurs phases qui ont notamment vu : 1) La naissance d'un cadre légal spécifique au développement du sport et la naissance de la Fondation de l'Aide Sportive Suisse ; 2) Une réorganisation du système du sport suisse qui s'illustre par la création ou la fusion des principales organisations privées et publiques et une nouvelle vision du sport incluant en particulier la promotion de l'éthique dans le sport ; 3) La lutte contre la corruption organisationnelle dans le sport qui voit notamment l'amendement de la Charte d'éthique dans le sport et une prise de position de la Confédération suisse sur les scandales de corruption qui ont touché certaines OSI ; 4) Une vision globale du sport suisse qui se caractérise en particulier par la publication de trois concepts de promotion du sport et une réorganisation des relations entre acteurs publics et privés.

Discussion/Conclusion: Contrairement à certains pays anglo-saxons où le processus de codification de la gouvernance est très marqué (Walters and Tacon, 2018), le système du sport suisse ne dispose pas, à l'heure actuelle, d'un code de « bonne » gouvernance contraignant dont le respect des critères par des organisations sportives conditionnerait un soutien financier. En s'appuyant notamment sur les caractéristiques de sa gouvernance politique, il a su emprunter des voies plus nuancées.

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Title:

Influence of aerobic fitness on inhibitory control and prefrontal brain oxygenation

Authors:

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Abstract:

Introduction: The degree of aerobic fitness can have an influence on higher cognitive functions and change activity patterns in relevant brain regions. Recent research showed that in adults higher levels of fitness are associated with better inhibitory control and higher oxygenation of the right inferior frontal gyrus (Dupuy et al., 2015) and the dorsolateral prefrontal cortex (DLPFC; Albinet et al., 2014). However, it is unclear if similar patterns can be found in younger age groups as well.

Methods: 42 healthy, male, right-handed participants aged 16-20 years performed a computerized Stroop Color-Word task. Lower stroop interference (reaction time in incompatible trials minus compatible trials) represented better inhibitory control. Simultaneously, 23-channel functional near-infrared spectroscopy (fNIRS) was used to measure oxygenation in the prefrontal cortex. Aerobic fitness was determined using the Physical Working Capacity 170 test (PWC170, (Bland, Pfeiffer, & Eisenmann, 2012)). A median split was used to separate fitter (Group 1) and less fit (Group 2) participants.

Results: Group 1 (3.4 W/kg) showed a significantly higher aerobic fitness than Group 2 (2.5 W/kg; $t(41) = 8.30, p < .001$). Interference was significantly higher in Group 2 (56.9 ms) compared to Group 1 (27.1 ms; $t(41) = -2.40, p = .021$), indicating better inhibitory control in fitter participants. Cluster based permutation testing revealed significant group differences in channel 22 representing brodmann area 46 (right DLPFC), with higher oxygenation during the inhibition task in fitter participants.

Discussion/Conclusion: Our data suggest that physically fitter adolescents show better inhibitory control than their less fit peers. In line with previous studies, this was accompanied by increased oxygenation in the right DLPFC.

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Albinet, C. T., Mandrick, K., Bernard, P. L., Perrey, S. & Blain, H. (2014). Improved cerebral oxygenation response and executive performance as a function of cardiorespiratory fitness in older women: A fNIRS study. *Frontiers in Aging Neuroscience*, 6, 272. <https://doi.org/10.3389/fnagi.2014.00272>

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Title:

MOBITEC-GP - Mobility Assessment with Modern Technology in Older Patients' Real-Life by the General Practitioner

Authors:

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Abstract:

Introduction: Mobility limitations in older adults are associated with poor clinical outcomes including higher mortality and disability rates (Netuveli et al., 2006). A decline in mobility is detectable and should be discovered as early as possible, as it can still be stabilized or even reversed in early stages by targeted interventions (Pahor et al., 2014). General practitioners (GPs) would be in the ideal position to monitor the mobility of their older patients routinely. However, easy-to-use and valid instruments for the assessment of mobility in the real-life setting are missing. Modern technologies such as the global-positioning system (GPS) and accelerometry (ACC) - nowadays embedded in every modern smartphone - could facilitate the monitoring of different aspects of mobility over time.

Methods: The aim of the project is to provide GPs with an innovative smartphone application that allows quantifying and assessing their older patients' mobility easily.

The project consists of three parts: the development of the GPS- and ACC-based application for the smartphone, the evaluation of the application's validity and reliability (study 1), and the evaluation of the applicability and acceptance in the everyday general practice setting (study 2). Following a user-centered design approach, the developmental process will consist of several iterations, considering feedback and opinions of GPs and their patients.

In study 1, participants (target N = 72, aged 70+, ≥2 chronic diseases; recruited in GP practices) will perform a battery of walking tests (varying distances; varying levels of standardization) at the study center. Besides videotaping and timing (gold standard), a high-end GPS device, a medium-accuracy GPS/ACC logger and three different models of dual-antenna smartphones will be used to determine mobility parameters such as walking speed and cadence. Furthermore, participants will wear a medium-accuracy GPS logger and a smartphone for a week to determine their life-space. Participants will be re-assessed after four weeks (re-test). In study 2, participants (target N = 60, aged 70+; recruited in GP practices) will be instructed in their GP's practice on how to use the application. Patients will then perform smartphone-based mobility assessments (walking: low level of standardization) independently at their own homes and aggregated results will be presented to the GPs. Patients and GPs will evaluate the usability of the application. The application will then be finalized and publicly released.

Discussion: If successful, the MOBITEC-GP application will offer health care providers the opportunity to follow their patients' mobility over time and to recognize impending needs (e.g. for targeted exercise) within pre-clinical stages of decline.

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Title:

Reliability of the subjective gait analysis method "V[®]SCORE" and relationships with objective indices

Authors:

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Abstract:

Introduction: Running gait analysis is a major focus in the field of sports sciences and sports medicine. Gindre and al. showed in 2016 that runners move and run with a preferred pattern. They developed a subjective visual analysis method called V[®]SCORE which is used to separate runners into two categories: "aerial" and "terrestrial". The primary objective of this study was to evaluate inter-tester reliability of the V[®]SCORE method during a short run on treadmill in neophyte and expert users. The secondary objectives were to observe the correlations of objective running gait parameters measured using two marketed sensors (Garmin FR630 and GaitUp Physilog) and the V[®]SCORE method, answering the question: can on-board sensors give sensitivity to motor preferences? Correlations between sensors were also observed on contact time and cadence.

Methods: Objective parameters of the running gait in 28 subjects (8 W, 20 M, running at least 20km/week) were collected over 1-minute races at different speeds (9, 11, 13 and 15kph). Subjects were equipped with a Garmin FR630 sensor and Gait Up Physilog sensors and were filmed for 10 seconds on back and side view with a Go Pro camera. The V[®]SCORE was then determined by analyzing the videos by 2 neophytes and 1 expert investigators. Links between V[®]SCORE and objective indexes have been analyzed with one neophyte investigator chosen randomly.

Results: Inconsistent reliability in neophytes was shown after statistical analysis using intraclass correlation coefficient (ICC). The lowest ICC (0.54) is at 11kph with the highest ICC (0.73) at 15kph. Reliability was also inconsistent when compared with the expert scoring with a highest ICC (0.33) at 11kph and lowest ICC (0.08) at 15kph. Comparing objective and subjective methods in one neophyte investigator, we noticed concordances between vertical oscillation (VO), steps per minutes (SPM), both measured by the Garmin sensor and the V[®]SCORE. The higher the V[®]SCORE is, the higher his VO and the lower his SPM are. When comparing the same outcomes with the two sensors, very similar results are found on the SPM with a correlation coefficient (CC) of 0.93 but poor correlation is found on the ground contact time with a CC of 0.6.

Discussion/Conclusion: Results shows that inter-rater reliability of the V[®]SCORE makes the method somewhat unreliable when used by neophytes. It looks like an interesting subjective method but might be reconsidered as a tool for experts only. Even if reliability is low in neophytes, V[®]SCORE is correlated with results from sensors which could make it an interesting running gait analysis method. Sensors analysis has to be considered with caution as they provide different results on the same outcomes.

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Gindre, C., Lussiana, T., Hebert-Losier, K., & Mourot, L. (2016). Aerial and Terrestrial Patterns: A Novel Approach to Analyzing Human Running. *Int J Sports Med*, 37(1), 25-29

Title:

Physical performance screening in high-level youth soccer players from under 15 to under 21 teams: A cross-sectional analysis

Authors:

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Abstract:

Introduction: Appropriately developed physical performance is a relevant prerequisite for high level soccer players, both from an on-field performance as well as from an injury prevention perspective. Regular performance screening is therefore essential in elite youth soccer academies in order to support an optimal development of individual athletes. The aim of this cross-sectional analysis was to compare lower extremity strength, sprint abilities, jump performance and intermittent endurance in elite youth soccer players of different age groups.

Methods: We tested 103 male youth soccer players (under 15: N=18; age=14.7 (SD 0.3) y; body mass=54.7 (9.1) kg; under 16: N=23; age=15.5 (SD 0.7) y; body mass=63.6 (6.6) kg; under 17: N=19; age=16.6 (SD 0.3) y; body mass=67.7 (7.3) kg; under 18: N=22; age=18.0 (1.12) y; body mass=71.7 (7.3) kg; under 21: N=21; age=18.7 (0.8) y; body mass=68.7 (6.6) kg) of the highest playing level in Switzerland. We assessed anthropometric data, isometric and isokinetic strength of hamstrings and quadriceps muscles, countermovement jump height, linear sprint (10 to 40 m splits) and agility speed and intermittent endurance performance. All tests were conducted under standardized conditions. Based on age-group averages, we calculated differences between age-groups.

Results: Performance was in most instances lowest in the under 15 team and increased up to the under 21 team. Absolute lower extremity strength increased from the under 15 to the under 16 team (by 13% to 26%), remained nearly constant up to the under 18 team and increased further from the under 18 to the under 21 team (by 6% to 19%). Between-team differences in relative strength were inconsistent. Countermovement jump height (+8%) and linear sprint times (+3% to +5%) increased from the under 15 to the under 17 team and remained nearly constant in the older age-groups. Agility sprint times improved only from the under 15 to the under 16 age-group (+5%) with no further improvement up to the under 21 team. Intermittent endurance was similar in the under 15 and 16 teams and then increased gradually up to the under 21 team (+21%).

Discussion/Conclusion: Our results show an increase in most physical performance indicators from the under 15 up to the under 21 team. The changes were, however, not linear and the change pattern differed between different physical abilities. Whereas sprint, agility and jump performance only increased up to the under 16/17 age-group and then remained stable, endurance began to rise after the under 16 level. Strength showed an initial increase followed by a plateau and a final increase up to the nearly full matured players. As our study is based on cross-sectional data, we cannot conclude on causal relationships. Changes in athletic training contents, physical maturing and/or (de)selection decisions during the talent development process are probable confounders. Further analyses of longitudinal changes in physical performance indicators on an individual basis accounting for a thorough documentation of training contents and maturational status are warranted to gain insights into the optimal development of elite youth soccer players.

Title:

Gait symmetry improvement during running on treadmill compared to overground in subjects with laterally pronounced knee osteoarthritis

Authors:

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Abstract:

Introduction: Injured runners are known to show high variability (Mills, Hettinga, Pohl, & Ferber, 2013), but it remains unclear if running behavior is altered when performed overground (OG) or on a treadmill (TM). In this study, we first analyzed the OG running asymmetry between affected (AF) and not affected (NA) leg in subjects with unilateral knee osteoarthritis (KOA). We then investigated whether the use of TM influences the running gait symmetry.

Methods: The experiment was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of the University of Freiburg, Germany (107/12). Nine patients (6 women and 3 men) diagnosed with KOA, which gave written informed consent, underwent OG and TM running with 3D-motion analysis. We measured the lower body segment kinematics (Vicon, modified Plug-in-Gait marker set) to obtain five gait parameters: contact and step time, heel-toe delay, maximal knee flexion during stance and vertical speed variance. Based on foot markers we estimated the delay between heel and toe touch, the contact phase and the step duration (step begin at touchdown and end at the next touchdown). The average of the four pelvis markers was used to estimate the center of pelvis (COP) location to calculate the knee flexion and the vertical speed variance for each step (Cavagna, Thys, & Zamboni, 1976). For each kinematic parameter, the average over all AF and NA steps was retained. The symmetry of these parameters was expressed by using the so-called symmetry angle (Zifchock, Davis, Higginson, & Royer, 2008) for OG and TM locomotion.

Results: For all parameters, the values were significantly lower for the affected compared to the NA leg ($p=0.023$). Post-hoc analyses revealed significant differences between legs only overground and not on the treadmill. The asymmetry was lower on the treadmill, as indicated by significant Symmetry Angle reductions for contact time ($p = 0.033$), knee flexion ($p = 0.001$) and vertical speed variance ($p = 0.002$).

Discussion/Conclusion: The symmetry increase on the treadmill was mainly due to changes of the non-affected leg towards the affected leg values leading to smaller steps and less impact load in general. The present results suggest therefore that a) an assessment of symmetry may differ depending on the ground type (treadmill versus overground) and b) treadmill running may be more suitable for patients with KOA related gait asymmetries.

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Title:

Measurement of lower extremities' power with as smartphone application: a pilot study

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Abstract:

Introduction: Regular and valid performance tests are a necessity in occupations with high physical demands. Thus, several measurement procedures to estimate the muscle power in the lower extremities are available. A valid and reliable test is the standing long jump, performed in the test batteries of several Armed Forces worldwide (Foulis et al., 2017; Wyss, Marti, Rossi, Kohler, & Mäder, 2007). In a field setting, testing procedures with little material requirements are sometimes beneficial. Therefore, the aim of this study was to analyze the accuracy and reliability of a lower extremities power measurement assessed with a mobile application.

Methods: For the accuracy part, 71 volunteers performed two different jumps, a standing long jump and a slightly modified countermovement jump (Wyss, Roos, & Beuchat, 2017). The countermovement jump was modified in a way that the hands were holding a smartphone in front of the chest instead that the hands were placed on the hips. For the reliability part, ten volunteers repeated the countermovement jump with the smartphone on three separate days. The self-programmed smartphone application used the y-axis acceleration data to compute flight time in milliseconds. Descriptive and statistical analyses were performed to assess correlation coefficients of accuracy and reliability measurements. Data are shown as mean \pm standard deviation.

Results: The volunteers jumped on average 2.35 ± 0.36 m during a standing long jump and on average a flight time of 596.85 ± 58.45 ms during the countermovement jump was observed. The correlation coefficient between the two jumps was $r = 0.829$. A root mean square error of 0.16 m was reported, when standing long jump distance was estimated based on countermovement jump flight time.

Discussion: The results showed that the modified countermovement jump assessed on a mobile application reported a high correlation with the standing long jump. To conclude, the mobile application can be recommended to assess lower extremities' power in a field setting.

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Title:

Sportpsychologische Unterstützung von Spitzensportlern beim Karriereende: Eine Einzelfallstudie

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Abstract:

Einführung: Transitionen stellen in der Laufbahn jedes Athleten immer wieder neue Herausforderungen dar. Wenig Beachtung fand bisher der Übergang in die Nachsportkarriere, obwohl zwischen 15 und 19% der Athleten nach ihrem Karriereende emotionale Anpassungsschwierigkeiten erleben (Grove et al., 1998; Wylleman, Alfermann & Lavallee, 2004). Anhand einer Einzelfallstudie wird erläutert, mit welchen Herausforderungen Athleten beim Übergang in die Nachsportkarriere und die Zeit danach konfrontiert werden können und wie aus sportpsychologischer Sicht diese Phasen bestmöglich begleitet werden können. Diese Arbeit versucht demzufolge zu ergründen, welche Hürden, Stolpersteine und erleichternde Faktoren den Übergang in sowie die Nachsportkarriere bestimmen können.

Methode: Es wurde ein systematisches Einzelfallinterview in Anlehnung an einen Fragekatalog zum Rücktritt von Spitzensportlern (Küttel et al., 2017) durchgeführt. Die Antworten der Athletin wurden paraphrasiert und eine Inhaltsanalyse wurde durchgeführt.

Resultate: Die Athletin berichtete bis zwei Jahre nach dem Rücktritt über Anpassungsschwierigkeiten. Dies sei insbesondere der Fall gewesen, weil sie hauptsächlich auf sich alleine gestellt war, keine Unterstützung nach der Karriere erhielt und keine vorgegebene Struktur im Leben mehr hatte. Weitere Hauptthemen waren der Verlust der Identität als Sportlerin - sie hatte das Gefühl, jetzt langweilig zu sein. Eine weitere Thematik betraf die Abnahme des Selbstwertes, was unter anderem auf Veränderungen des Körperbildes zurückzuführen war. Als positiven Punkt hob die Athletin die Stabilität in der Fortführung der Ausbildung hervor. Dies führte unter anderem dazu, dass sie die berufliche Karriere direkt nach dem Rücktritt in Angriff nehmen konnte. Die Sportlerin hätte sich rückblickend insbesondere eine Möglichkeit zum Austausch und das gezielte Einholen von Informationen gewünscht.

Diskussion/Konklusion: Ein beträchtlicher Anteil an Athleten erlebt im Übergang in die nachsportliche Karriere gravierende Anpassungsschwierigkeiten. Dies ist mit ein Grund, warum Spitzensportler auf den Übergang in die Nachsportkarriere und die Zeit danach bestmöglich vorbereitet und unterstützt werden sollten. Basierend auf diesen Erkenntnissen wurde ein Interviewleitfaden zur optimalen Unterstützung von Spitzensportlern nach dem Karriereende entwickelt. Mit dessen Hilfe soll erreicht werden, Athleten, welche mit hoher Wahrscheinlichkeit auf die Anforderungen des Karriererücktritts mit Anpassungsproblemen reagieren werden, auszumachen und gezielt unterstützen zu können.

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Title:

Using the Jigsaw cooperative teaching method to increase physical activity in physical education

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Abstract:

Introduction: The World health organization (WHO) recommends at least 60 min of daily physical activity (PA) for the 5-17 year-old adolescents. However, 80% of adolescents in the World don't reach this minimum (Hallal et al., 2012). Consequently, youth PA promotion has been identified as a global health priority by the WHO and physical education (PE) is among the best opportunities for enhancing and promoting healthy lifestyles (Lonsdale et al., 2013). There is a close relationship between students' motivation and PA (Ng et al., 2012). Using an adapted version of the Jigsaw (Aronson, 1978), a cooperative teaching strategy could increase students' motivation and consequently their PA level.

Methods: Three PE teachers with two classes each were recruited (six classes in all). For each teacher, a control and an experimental class were defined. In the control classes, the practice teaching style was used whereas the Jigsaw cooperative learning method was used in the experimental class to teach the same activity unit; i.e., the speed relay. The moderate to vigorous PA was recorded for each student in the control and experimental classes during one teaching unit (9 classes using Jigsaw and 5 control classes from September to November 2018) with accelerometers (Actigraph GTX3+).

Results: The data are currently under analysis. We will compare the level of students' PA assessed by accelerometers in both contexts, i.e., practice teaching style units and Jigsaw method units.

Discussion/Conclusion: It is hypothesized that the Jigsaw cooperative teaching method would increase students' motivation and engagement and that students from experimental classes will have higher PA levels compared to students from control classes.

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Title:

Effect of eccentric-isokinetic strength training on maximum resistance, holding time and execution of static strength elements on rings of elite gymnasts

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Abstract:

Introduction

On rings in men's artistic gymnastics, athletes are allowed to perform up to eight strength elements in their routine. A high level of relative maximum strength in the upper limbs and advanced balance skills in the hold positions are crucial for performing these static strength elements with the required execution quality (Bango, Sillero-Quintana & Grande, 2013). Since gravity must be overcome while holding a strength element, the decelerating work of arm and shoulder muscles may at least partly be similar to an eccentric muscle contraction.

For this reason, coaches have begun to increasingly incorporate specific eccentric exercises on rings into athletes' strength training. Since eccentric training is a generally low-energy-cost method to effectively overload muscles (Isner-Horobeti et al., 2013), the adjunct of ring-specific eccentric exercises in gymnastics could be useful.

However, coaches constantly face the conflict between stress tolerance of the athletes' joints and tendons and the efficacy of the applied strength training methods. In this context, it should be noted that the rings are an unstable apparatus and together with the high joint torques during the eccentric movement under "isoinertial conditions" (constant load), eccentric strength-exercises on rings can pose a high injury risk.

In the present study, eccentric exercises were therefore executed with a constant velocity (isokinetically) by means of a computer-controlled training device. The advantage of this approach is that movement velocity and load can be individually selected for each athlete in order to simulate various sport-specific movements while still being in a highly controlled and predictable environment.

Thus, the aim of this study was to investigate the effects of a four-week eccentric-isokinetic training period with such a device on maximum resistance, maximum holding time and execution of the static strength elements Swallow and Support Scale on rings.

Methods

Nine national or international top-level gymnasts (age: 21.47 ± 1.96 y; height: 169.84 ± 5.47 cm; weight: 69.39 ± 7.00 kg) performed the elements Swallow and Support Scale on rings for five seconds with a maximal resistance (body weight with either additional weight or a counterweight according to Hübner & Schärer, 2015) one week before (test 1) as well as one and three weeks after (test 2 and 3) a four-week eccentric-isokinetic training intervention. For tests 2 and 3, athletes also performed each element with the pre-intervention resistance for a maximal duration. In order to analyze the hold position of the performed elements, the trials were motion-captured using nine 3D-cameras (Vicon Vantage, Vicon Motion Systems Ltd., UK) (120 Hz) and 43 reflective markers (\varnothing 14 mm) placed on the gymnasts' joints of the lower and upper limbs (Plug-in-Gait model).

Before test 1 and after test 3, athletes were asked whether shoulder pain limited their everyday training at the time and if the shoulder pain had changed during the training period.

The eccentric-isokinetic training (two sessions per week) was realized with the 1080 Quantum Syncro (1080 Motion, Lidingö, SWE). The gymnasts lay supine on a bench with outstretched arms (shoulder angle: $50-70^\circ$) holding onto rings that were fixed with cables to the device. The cables were reeled in synchronously with a constant velocity (0.1 m/s) while athletes provided constant resistance with maximum force and fully extended arms. The mean duration of one repetition was 5 s. The number of repetitions varied each week (Week 1: 2 cluster sets of 4x4 reps; Week 2: 3

cluster sets of 3x4 reps; Week 3: 2 cluster sets of 3x4 reps; Week 4: 3 cluster sets of 4x4 reps). Gymnasts had 20 s rest between clusters and 10 min rest between sets.

Descriptive statistics were run on all dependent variables, whereas changes between the three tests were assessed using the Wilcoxon-Test (p) and effect sizes (r) that were rated according to Cohen (1988). The level of statistical significance was set to $p \leq 0.05$.

Results

The maximum resistance for the Swallow increased significantly from test 1 to 3 ($p = 0.05$, $r = 0.49$) and displayed a medium effect size between tests 1 and 2 ($p = 0.07$, $r = 0.43$). Further, maximum resistance of Support Scale increased significantly (large effect) from test 1 to 2 ($p = 0.01$, $r = 0.59$) and test 1 to 3 ($p = 0.02$, $r = 0.59$).

The maximum holding time of the element Swallow increased significantly between all tests (test 1 vs. 2: $p = 0.05$, $r = 0.46$; test 1 vs. 3: $p = 0.04$; $r = 0.53$; test 2 vs. 3: $p = 0.04$, $r = 0.53$).

Further, a significant increase of the maximum holding time of support scale was found between tests 1 and 2 ($p = 0.05$, $r = 0.46$) and a positive trend between tests 1 and 3 ($p = 0.07$, $r = 0.46$).

The hold positions of both elements Swallow and Support Scale were statistically similar across all tests ($p > 0.05$; $r < 0.5$).

After the four-week training period, almost half of all gymnasts ($n = 4$) reported that the shoulder pain had been reduced with the eccentric-isokinetic training.

Discussion/Conclusion

The investigated eccentric-isokinetic strength, although not performed on rings, caused large, specific strength gains for the elements Swallow and Support Scale. Thus, the maximum contractions applied during very slow eccentric movements seem to have evoked adaptations which enhance the performance of static hold elements on the rings. More specifically, the increase of the maximum holding time of the element Swallow (performed with the pre-intervention maximum resistance) means that the specific endurance on rings has improved, which may enable the gymnasts to perform more difficult strength elements in their routines. Considering the fact that the participating athletes were highly trained and have previously performed ring-specific strength training, these results may surprise. Traditionally, ring-specific strength is trained with either concentric barbell exercises (Hübner & Schärer, 2015), by holding the elements with help of the coach or with eccentric-isoinertial exercises (e.g. lowering from handstand to Swallow). Therefore, the eccentric-isokinetic exercise in this study represents a novel stimulus for the athletes, which might be a reason for the consistent improvements. Another important factor explaining the longer maximum holding time may be related to the time under maximum tension encountered during the strength training sessions. In the current study, this was around 2 to 4 minutes per session, which is approximately four times as long as the cumulated holding time used in traditional ring-training interventions.

From a physiological perspective, the considerable strength gains and the reduction of shoulder pain after training may be caused by structural changes in the muscle-tendon system. Eccentric exercises were reported to cause a deterioration of the cytoskeleton and local inflammations of muscle fibers and were shown to result in delayed onset muscle soreness (Lieber & Friden, 2002). The fiber-repairing processes lead (inter alia) to sarcomerogenesis and collagen synthesis, which increases stiffness of the muscle-tendon system (Pousson, Van Hoecke & Goubel, 1990). The latter was assumed to be beneficial for maximum strength gains and can help to prevent injuries of muscles and tendons (LaStayo et al., 2003).

However, it must be mentioned that this training method causes a high physical strain on the upper limbs and could therefore have acute negative effects on the athletes' performance in the regular training. Consequently, it is recommended to use this intense stimulus to disturb homeostasis in an early preparatory phase of competitions and not continuously throughout the season.

In conclusion, it can be said that the eccentric-isokinetic training in this study can be recommended for elite gymnasts as a training method to break with the traditional training routine of ring-specific or barbell exercises. Noteworthy, maximum specific strength of the Swallow and Support Scale can be improved in a short period of time making this training intervention suitable for the early phase

of preparation before competitions. Further, eccentric-isokinetic training may reduce shoulder pain of elite gymnasts probably due to structural adaptations of the muscle-tendon system.

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Title:

Kognitiv-anspruchsvolle sportliche Aktivität und kognitive Leistung: Profitieren denkfaule Menschen weniger?

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Abstract:

Einführung: Während im Zusammenhang von akuter körperlicher Aktivität und kognitiver Leistungsfähigkeit weitestgehend Konsens hinsichtlich der Gestaltung von quantitativen Merkmalen (Dauer und Intensität) besteht, sind in Bezug auf die qualitativen Merkmale (Modalität) noch etliche Fragen offen. So ist beispielsweise unklar, ob eine Dosis-Wirkungs-Beziehung zwischen kognitiver Beanspruchung einer sportlichen Aktivität und den danach gemessenen exekutiven Funktionen (EF) besteht. Und obwohl des Öfteren über allfällige interindividuelle Unterschiede in der Reaktivität auf sportliche Intervention spekuliert wird, sind in Sport und Kognitionsstudien kaum differentielle Analysen zu finden. Daher wird in der vorliegenden Untersuchung geprüft, ob (a) die systematische Manipulation der kognitiven Beanspruchung einer akuten sportlichen Aktivität die EF von gesunden Erwachsenen beeinflusst. Einem differentiell-psychologischen Ansatz folgend wird zudem untersucht, ob (b) das individuelle Bedürfnis nach kognitiver Herausforderung (Need for Cognition), den Zusammenhang zwischen kognitivem Anspruch und den EF moderiert.

Methoden: Mit Hilfe eines ausbalancierten within-subjects-Designs wurden 48 Studierende (M=25.35±3.22 Jahre; 50% weiblich) untersucht. Nach der Messung der maximalen Sauerstoffaufnahme-fähigkeit, dem Need for Cognition und weiteren Hintergrundvariablen durchliefen die Probanden vier experimentelle Bedingungen: Eine sitzend (mit niedriger kognitiver Beanspruchung) und drei moderat körperlich aktiv auf dem Fahrradergometer (mit niedriger, mittlerer oder hoher kognitiver Beanspruchung). Während der 20-minütigen Intervention wurden, neben der objektiv gemessenen Herzfrequenz (65% HRR), mithilfe verschiedener Fragebögen die kognitive und körperliche Beanspruchung, der Stress und der Affekt gemessen. Nach einem fünfminütigen Cool-Down wurde jeweils ein computerbasierter Stroop-Task zur Messung der EF durchgeführt.

Resultate: Die varianzanalytischen Vorauswertungen verweisen auf eine gelungene Manipulation: Die drei „körperlich-aktiven“ Bedingungen unterscheiden sich in Bezug auf die Herzfrequenz nicht voneinander, jedoch von der sitzenden Bedingung ($F(3, 141) = 672.60, p < .0005$). Zudem scheinen sich die Bedingungen hinsichtlich der manipulierten kognitiven Beanspruchung zu unterscheiden ($F(3, 9) = 3.74, p = .012$, partielles $\eta^2 = .057$). Weitere Voranalysen bestätigen eine Veränderung des Affekts sowie des wahrgenommenen Stresses über die verschiedenen Bedingungen. In den allgemein-psychologischen Auswertungen konnten die erwarteten Effekte der kognitiven Beanspruchung auf die EF in den Reaktionszeiten, noch in der Genauigkeit der Antworten nachgewiesen werden ($p > .05$). Die differentiell-psychologischen Auswertungen zeigen allerdings, dass unter Hinzunahme der Kovariate Need for Cognition ein signifikanter Effekt der kognitiven Beanspruchung auf die Reaktionszeiten zu verzeichnen ist ($F(3, 138) = 3.655, p = .014$, partielles $\eta^2 = .074$).

Diskussion: Obwohl bei der allgemein-psychologischen Fragestellung kein Haupteffekt der kognitiven Beanspruchung auf die EF gefunden werden konnte, zeigen differentiell-psychologische Analysen, dass Menschen mit einem hohen Bedürfnis nach kognitiver Herausforderung von einer kognitiv anspruchsvollen sportlichen Aktivität stärker profitieren als Menschen mit einem niedrigen Bedürfnis. Die Ergebnisse verdeutlichen, dass ein und dieselbe sportliche Aktivität nicht für jede Person die gleiche kognitionsfördernde Wirkung hat.

Title:

Prognostic validity of general versus specific motor performance in Swiss football talents

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Abstract:

Introduction: To reduce false decisions within talent selection, the use of multidimensional models has been suggested. Although this approach is promising, manifold problems in dealing with extensive data from numerous dimensions remain unsolved, e.g. how to combine data for an overall selection decision (Sieghartsleitner, Zuber, Zibung, & Conzelmann, 2019)? Thus, exploring the most powerful predictors of future performance with the intention to exclude less important areas and reduce the complexity of selection strategies is still a relevant field of talent research. While motor performance is frequently considered for talent selections, the detailed value of general (e.g. speed, power) versus specific motor performance (i.e. technical skills) for predicting adult success has hardly been researched (Murr, Feichtinger, Larkin, O'Connor, & Höner, 2018). Hence, the current study investigates the usefulness of general and specific motor performance for talent selection by comparing their long-term prognostic validity within Swiss football players.

Methods: At U13 / U14 age group, a sample of 133 regional football players (17 professionals) participated in general (40m-sprint, agility, counter-movement-jump, YoYo) and specific motor performance tests (dribbling, passing, juggling, shooting). A sample of 85 players (23 pro-fessionals) did the same tests at U16/U17 age group. The performance criterion (1st to 3rd league in Switzerland = professional; 4th league and below = non-professional) was assessed within U20 age group, which means from three up to seven years after the measurements. Data analysis conducted binary logistic regressions and subsequent receiver operating characteristic curves. Quality of the discrimination between professional and non-professional players was evaluated by means of area under the curve (AUC) from the latter. Finally, AUCs from general and specific motor performance within an age group were compared by a non-parametric Z-test.

Results: AUCs [95% CI] within U13 age group did not show a significant difference between general and specific motor performance (0.68 [0.53; 0.82] vs. 0.77 [0.66; 0.88], $Z = 1.38$, $p = 0.17$). Similar results were found at all further researched age groups of U14 (0.65 [0.52; 0.78] vs. 0.79 [0.67; 0.91], $Z = 1.79$, $p = 0.07$), U16 (0.68 [0.55; 0.81] vs. 0.74 [0.63; 0.85], $Z = 0.80$, $p = 0.42$) and U17 (0.67 [0.55; 0.80] vs. 0.71 [0.59; 0.83], $Z = 0.46$, $p = 0.65$).

Discussion/Conclusion: Prognostic validity of general ($0.65 \leq AUC \leq 0.68$) and specific motor performance ($0.71 \leq AUC \leq 0.79$) appeared quite stable through different age groups. Whilst there is a constant superiority of specific over general motor performance in descriptive values, not any of the inferential comparisons lead to a significant difference. However, the AUC assessment from Hosmer and Lemeshow (2000) underpins the importance of a decile difference (e.g. AUC of 0.70 = acceptable, while 0.80 = excellent discrimination), which is the case between general and specific motor performance, at least in U13/U14 age group. Therefore, the current differences may rather express a relevant, but not significant difference. According to the research question, there seems to be certain evidence that specific motor performance is more useful than the general one. As a consequence, within sound and feasible talent selection models in football (e.g. person-oriented models, which can process a limited number of variables), specific motor performance should rather be included, while general motor performance may have questionable prognostic validity.

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Title:

Specialisation or diversification within early sport participation of Swiss ice hockey talents - a person-oriented study

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Abstract:

Introduction

Because of prestigious reasons, almost every nation worldwide aims for sporting success. Among others, reaching this success is strongly influenced by frameworks for talent identification and talent promotion. With regard to effective promotion of young athletes, it is apparent that early sport participation in childhood is an important factor for later success (Baker et al., 2004). In the literature, there are two opposing theories regarding the early sport participation of children, which try to explain how sporting expertise develops. On the one hand, there is the approach of early specialisation (Ericsson et al., 1993). Here, the early selection of one sport in childhood is vital, combined with deliberate practice, as the sport specific, systematic and highly structured training to achieve the sporting excellence. It is assumed that the amount of targeted sport-specific training completed is related to the development of expertise. Contrary to this view, Côté et al. (2007) describe the approach of early sampling. They proclaim that children should try several different sports, and thus be poly-sportively active before deciding on a single sport domain. They also describe that deliberate play as an informal, unorganized and enjoyable sporting activity (e.g. street football) should be pursued along with early sampling, and state that early specialization within one sport is not appropriate (Côté et al., 2007). They rather assume that the enjoyment of sport in deliberate play is a source of high motivation, and that transfer effects between sports occur, which is most likely to develop expertise.

Empirical studies in Swiss football (Sieghartsleitner et al., 2018; Zibung & Conzelmann, 2013) showed that neither of the two opposite theories actually lead to sporting expertise. It was rather a combination of both approaches, called specialised sampling, which turned out to be promising. The presented studies revealed that the young footballers who specialised in one sport-specific domain and sampled through different experiences within this domain were most likely to be successful. In other words, although the players have concentrated on football, they have gained a wider range of experience, for example in club training but also in diversified informal settings. It seems that a combination of the two aforementioned approaches early specialisation and early sampling leads to the development of sporting expertise due to their combined positive aspects (e.g. huge number of hours in domain specific activities, high intrinsic motivation through different settings).

In terms of the transferability of these findings, the question arises as to whether the realisation of specialised sampling leads to subsequent high performance in adolescence and adulthood in other sport domains. In general, it is difficult to transfer results according to characteristics of successful frameworks for early sport participation between different sport domains, as several constraints of the domain may have essential impact on this topic (e.g. number of participants, age of highest performance, physiological and psychological requirements). However, Suppiah et al. (2015) assume that the more similar the sports are in terms of their nature and environmental restrictions, the more likely a transfer of results is possible. Therefore, the current study investigates if specialised sampling during early sport participation can also be proven as promising in Swiss ice hockey, which would assumed because of its comparable characteristics to Swiss football. In ice hockey, no quantitative research has yet been carried out on the question of sport participation in childhood.

Methods

The current study examined the patterns of four different factors that describe childhood sports activity up to 12 years of age. N = 98 former U16-junior national team players in ice hockey participated in the study (Mage = 26.30, SDage = 2.85). The data was collected using a retrospective

survey (Zibung & Conzelmann, 2013). To analyse the data, a person-oriented approach (Bergman et al., 2003) was used by conducting the multivariate pattern analysis LICUR (Linking Clusters after removal of a Residue; Bergman et al., 2003) with ROPstat (Vargha et al., 2015).

In a first step, a cluster analysis was carried out with the four sports participation factors: Club entry (age), club training (hours), free ice hockey (hours) and poly-sportive activities (hours) up to 12 years of age. Subsequently, it was examined whether there were increased probabilities for the transition of the resulting patterns to the performance criterion in adolescence, characterised by the number of participations in U18 World Championships. In a third step, the development of players towards adult performance level was investigated. The adult level performance criterion for expertise consisted of the number of games a participant played at a certain performance level up to 24 years of age.

Results

A five cluster solution turned out to be optimal: It can be seen that Ice hockey enthusiasts with above-average levels in free hockey and training in club show an increased probability of playing ice hockey on the highest performance level in adolescence (OR = 4.7, [1.3; 17.4], $p = 0.03$). Poly-sportive players, which have an extensive workload in ice hockey and high poly-sportive activity, did not show any transition to the highest performance level in adolescence ($\chi^2(1) = 2.3$, $p = 0.11$). The remaining clusters can be described as follows: Late-starting players (high club entry age), Hockey abstainers (early entry with low training workload), Specialised club players (highest workload training in the club). These clusters only showed random transitions to the performance criterion in adolescence.

With regard to further development towards adult expertise, it can be emphasised that the differentiation of the performance level in adolescence is already an excellent predictor of the adult performance level, by showing increased probabilities of transitions between the same levels of performance ($10.8 [2.8; 41.1] \leq OR \leq 39.7 [10.5; 150.3]$).

Discussion/Conclusion

The current research carried out is the first quantitative investigation in ice hockey that deals with the question of sport participation in childhood. The study showed that Ice hockey enthusiasts with high amounts of free hockey and club training are particularly successful, and more likely to achieve expertise.

It can be assumed that a specialisation in ice hockey with a diversified choice of training in ice hockey and several settings within the domain significantly increases the probability of later sporting success. The findings emphasize that the approach of specialised sampling is particularly suitable for subsequent development of expertise in ice hockey.

If one compares this study with the earlier person-oriented studies in Swiss football (Sieghartsleitner et al., 2018; Zibung & Conzelmann, 2013), it can be seen that the same patterns based on sports participation in childhood can be identified across the two team sports. In addition, it can be shown that the players, conducting specialised sampling, can be identified as highly successful. With respect to Suppiah et al. (2015), it may therefore be indeed possible to show that similar constellations of successful early sport participation are rather found in similar sports.

Discussed findings, complemented by the facts of random transitions to the highest performance level within Specialised club players and the absence of a deliberate play cluster, show that there is strong empirical evidence in Swiss ice hockey that neither the approach of early specialisation nor the approach of diversification have the sole potential to count for later sporting success. As a result, it can be assumed that the approach of specialised sampling, characterised by the combination of sport-specific and targeted training in the club in the sense of deliberate practice combined with deliberate play activities in the same or a similar sport, is particularly effective in achieving expertise in Swiss team sports.

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Title:

Perceiving passing opportunities in football: An information integration theoretical approach

Authors:

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Abstract:

Introduction: Athletes involved in interactive team sports are believed to perceive positional information such as the positions of team members and opponents by means of the behavioral opportunities the given situations afford them to carry out. To date, little is known about how multiple positional informers combine into such perceived opportunities. A recent study reported that open passing lanes to team members, loose defense by opponents, and team members' positions near the ball carrier related to ball carriers' decisions of whom they passed the ball, indicating the potential role these positional informers may have on the perception of passing opportunities (Steiner et al., 2018). However, the effects of the positional information on passing decisions varied substantially across situations. One interpretation of these varying effects is that various athletes adopt different strategies of how they use contextual information. The aim of this study was to test the plausibility of this interpretation by analyzing athletes' integration of positional information into perceived passing opportunities and by testing whether athletes differ from each other regarding the importance they attribute to specific informers.

Methods: Twenty-six male soccer players (M = 24.89 years, SD = 3.50) participated in the scenario-based study. Adopting methods developed within the framework of the Information Integration Theory (IIT; Anderson, 1982), the study used a 3x3x3 full factorial within-subject design. Each participant rated 27 passing opportunities resulting from the combination of three values in each of a passing opportunity's position-related factors (distance, openness of passing lane, defensive coverage). Data analysis included mixed linear modelling and inspection of individual information integration diagrams (IIDs).

Results: In the total sample, all three kinds of position-related information significantly affected the participants' perceptions of the passing opportunities. Expectedly, the perceived quality of a passing opportunity increased the more open a passing lane to a team member became, the looser the team member was defended, and the closer he was to the ball carrier. However, individual IIDs revealed interpersonal differences in the athletes' information integration: while most athletes seemed to integrate the positional information linearly, the perception of some athletes seemed to be based on the centering of one specific positional informer, or on a multiplicative information integration. Furthermore, significant random effects (β variance) of the factors openness of passing lane, defensive coverage, and distance revealed inter-individual differences in how much the positional information affected the players' perceptions.

Discussion/Conclusion: The study provides evidence for the involvement of three kinds of positional information in players' perception of passing opportunities. It reveals substantial interpersonal differences in the use of the information, supporting the interpretation that the varying effects of positional information on passing decisions found by Steiner et al. (2018) could be explained by interpersonally different perceptions of passing opportunities. A main Implication for research is to design studies that combine perception and decision measures and to test how the perception of passing opportunities actually mediates athletes' passing decisions.

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Title:

The effects of exercise on the symptoms of peripheral neuropathies – a meta-analysis

Authors:

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Abstract:

Introduction: Peripheral neuropathies (PNP) encompass a large group of disorders of heterogenous origin and represent a highly prevalent disease group (5-9% (Hanewinckel et al.) of the population). To date, effective treatment options are lacking and causal therapies only barely exist for inflammatory neuropathies. Promising results have been achieved with specific exercise interventions (Streckmann et al.). Our objective was therefore to conduct a systematic review with meta-analysis on specific exercise interventions tailored for neuropathic patients in order to reduce the symptoms of PNP.

Methods: This systematic review was performed according to the PRISMA guidelines. Two independent reviewers searched electronic databases for relevant studies (until November 2018) and extracted relevant study information. We included studies in human subjects using a randomized, controlled design, conducting an exercise intervention and assessing parameters related to PNP. We calculated standardized mean changes (Hedges'g) of the training effect in the intervention relative to the control group. Data were analysed using inverse-variance models with random effects.

Results: Out of 10702 search results, 36 full text studies were identified and 11 Studies (3 CIPN and 8 diabetes) fulfilled the criteria for the meta-analysis. Most studies targeted diabetic neuropathic patients. For these patients, the meta-analysis revealed beneficial effects on postural sway through balance training, Tai Chi, multimodal approaches, Frenkel, ball or plantar-stimulation ($g = -0.62$ [95% CI, -0.96,-0.28]). Patients in the intervention groups improved in the berg balance scale ($g = -0.50$ [-0.85,-0.15]) as well as in the timed-up-and-go test ($g = -0.39$ [-0.7,-0.07]) through balance training. Furthermore, HbA1c was reduced ($g = -0.39$ [-0.7,-0.07]) and nerve conduction velocity increased (N. suralis: $g = -2.0$ [-4.11,0.11]; N. peroneus: $g = -1.17$ [-2.4,0.06]) through endurance training. Data on the effects of multimodal and/or sensorimotor training in CIPN is currently insufficient.

Discussion/Conclusion: To conclude, patients with diabetic neuropathy benefit from exercise interventions. They are able to improve balance parameters and functional mobility, mainly through sensorimotor training, while effects can be seen regarding HbA1c as well as for the nerve conduction velocity through endurance training. Regarding CIPN, data is insufficient to derive evidence-based recommendations and further high-quality studies are needed. For diabetic neuropathy, endurance and SMT target the symptoms as well as functional mobility best.

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Title:

Comparison of subjective and objective parameters in the assessment of chemotherapy-induced peripheral polyneuropathy (CIPN): an exploratory analysis

Authors:

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Abstract:

Introduction: Chemotherapy-induced peripheral neuropathy (CIPN) is one of the most relevant side effects of cancer treatment (Wonders, Reigle, & Drury, 2011). The diagnosis of CIPN is usually based on the objective assessment of the nerve conduction velocity (NCV) of the N. tibialis, N. suralis and N. peroneus. Experiences from clinical practice, however, suggest that treatment alterations are based on subjective reporting of CIPN related symptoms that not necessarily correspond to changes in NCV (Streckmann et al., 2018). We aimed to compare NCV measurements of N. tibialis and N. peroneus with the subjective assessment of clinical symptoms in patients with suspected CIPN.

Methods: Twenty-two patients (n=11 female, age = 58.2, SD 14.5) from two hospitals were included in our exploratory analysis if they reported symptoms typical for CIPN during or after chemotherapy. The patients suffered from breastcancer (n=3), lymphoma (n=7), ovarian-, adeno-, sigma-, colon- and lacteal-carcinoma (n=11) and Morbus Hodgkin (n=1). Patients were treated with vinca alkaloids (n=9), oxaliplatin (n=8), taxanes (n=3) and platinum derivatives (n=2). We measured NCV of the N. tibialis and N. peroneus, conducted a short clinical exam (symptom survey, reflex test, lower leg strength, proprioception, peripheral deep sensitivity and touch sensation) and patients filled in the FACT questionnaire which assesses the severity of the subjective neuropathy symptoms. The diagnostic criterion for CIPN is a NCV lower than 40 m/s and an amplitude below 5 µV. The score in the clinical short exam describes the number of abnormalities ranging from one to eleven. The FACT questionnaire as well as the clinical exam indicate pathology if the total score is one or higher.

Results: The average FACT score was 13.3 ± 9.4 . All patients had a score higher than one. The average score in the short clinical exam was 8.0 ± 2.4 . All patients had a score higher than four. The average NCV was 41.0 ± 5.5 m/s for the N. tibialis and 44.2 ± 9.5 m/s for the N. peroneus. Seven patients had NCV faster than 40 m/s in both nerves, but reported pathological symptoms in both subjective clinical tests, i.e. consistent assessment between NCV and clinical tests was present in 15 out of 22 cases (68%). A diagnosis of CIPN corresponding with the subjective symptoms would have been possible in 41% of all patients (n=9) if just the NCV of either the N. tibialis or the N. peroneus was applied.

Discussion/Conclusion: Based on our results, we conclude that the assessment of NCV as single, objective marker is not appropriate to mirror the whole clinical presentation of CIPN. Clinical decisions on the continuation, reduction or even cessation of chemotherapy as a result of CIPN are commonly based on the clinical symptoms rather than the assessment of NCV. Therefore, it seems indicated to regularly include further tools, representing subjective clinical symptoms in the assessment of CIPN. As our analysis is based on a small heterogeneous sample, these results should be regarded preliminary.

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Title:

A theoretical framework proposing the mediating role of interoception in the relationship between physical activity and emotional regulation

Authors:

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Abstract:

Homeostatic regulation is vital for the preservation of bodily integrity and appears to be subsequently responsible for the regulation of our feelings and behavioural motivation in the development of emotion. Interoception, defined as the sensing and perception of internal bodily signals (Craig, 2002), is thought to play an integral role in this process. In this way, different internal bodily states build up mental representations, whereby different bodily states are associated with different feeling states. Here, however, the system is open to bias, and the emotions we feel are dependent upon how we interpret and appraise such sensations. In this way, our emotional experience is not always a direct and accurate representation of our internal state.

Previous studies have identified several ways in which interoceptive processing could be improved. The incorporation of physical activity, however, has rarely been addressed in past interventions. This is surprising since the detection and encoding of physiological signals has been considered a measure of intensity and guide of behaviour in sport for many years (Borg et al., 1967). Additionally, a shared neural activation has been identified during participation in both physical activity and interoceptive tasks. Furthermore, physical activity is also intrinsically related to not only physical but mental health, resulting in numerous ameliorative effects, such as decreased anxiety and greater regulation of stress. Although the underlying mechanisms remain largely unknown, recent research could be interpreted as evidence for the mediating role of interoception, where increased awareness of bodily sensations, as strengthened through physical activity, is responsible for greater emotional regulation.

Although there is nascent research supporting the link between physical activity and interoception (Georgiou et al., 2015), the implications of this relationship have not yet been explicitly considered in explaining the regulation of emotions. In the current review, therefore, we describe the psychobiology of interoception, physical activity and emotional regulation, as well as a framework to demonstrate why all concepts are interconnected and of immediate relevance for future research. It is important for the development of future interventions to establish how interoceptive processing is shaped by experience, and to understand how this information can be fostered to improve self and emotional regulation.

Title:

Strategische Positionierung von Nationen an den Olympischen Winterspielen.
Ein Vergleich zwischen Calgary 1988 und PyeongChang 2018

Authors:

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Abstract:

Introduction:

Der Wettbewerb zwischen den Nationen an den Olympischen Spielen nimmt zu. Die Finanzierungszahlen zeigen, dass Nationen wie Frankreich, Finnland, Japan oder Canada im Untersuchungszeitraum von 2001 bis 2010 immer mehr öffentliche Gelder in den Leistungssport investieren. In der Literatur wird von einem «ongoing sporting arms race» gesprochen (De Bosscher, Shibli, Westerbeek, & Van Bottenburg, 2015). Dies erhöht den Druck auf Entscheidungsträger im Leistungssportsystem, die zusätzlichen Finanzmittel strategisch zu investieren, um einen Wettbewerbsvorteil zu erzielen. Gleichzeitig liess das International Olympic Comité (IOC) das Olympische Programm an den Winterspielen enorm wachsen. 1988 wurden Medaillen in 46 Events vergeben, 2018 in 102 Events (+122%) (Weber, Kempf, Shibli, & De Bosscher, 2017). Die Literatur zeigt eine hohe Korrelation zwischen Medaillenerfolg und der Priorisierung der Finanzierung von Sportarten an den Winterspielen. In diesem Zusammenhang wird von einem «Portfolio» von unterstützten Sportarten gesprochen (Weber, De Bosscher, & Kempf, 2018). Folglich lässt die Verteilung der Medaillen pro Sportarten Rückschlüsse auf die Priorisierung der Sportarten durch die entsprechenden Nationen zu. Nun stellt sich die Frage, welche Priorisierungsstrategien an den Olympischen Spielen besonders erfolgreich sind.

Methods:

Exemplarisch wurde an den Olympischen Winterspielen von PyeongChang 2018 die Medaillenverteilung derjenigen Nationen untersucht, welche bereits an den Olympischen Winterspielen von Calgary 1988 Medaillen gewonnen haben. Die Verteilung der Medaillen wurde pro Winterdisziplinen (15 Disziplinen im Programm 2018) eruiert. Zusätzlich wurde die Entwicklung des Erfolgs dieser Nationen anhand der Entwicklung des Medaillenanteils (market share, siehe Shibli, De Bosscher, Van Bottenburg, & Westerbeek, 2013) aufgezeigt. Eine zweite Gruppe der aufstrebenden Wintersportnationen wurde untersucht, welche 2018 Medaillen gewonnen haben, jedoch nicht 1988. Zusätzlich wurde auch die Verteilung der Medaillen der Top-5-Nationen in PyeongChang 2018 analysiert.

Results:

Die folgenden Nationen weisen den markantesten Anstieg an Medaillenmarkt-Anteilen an den Winterspielen innerhalb der letzten 30 Jahren auf: Norwegen +11%, Kanada +6%, USA, Frankreich und Japan je 4%. Zu den Nationen, die Anteile verloren haben, gehören: die Schweiz -6%, Österreich und Finnland je -3%. Die Resultate der erfolgreichsten neuen Wintersportnationen zeigen, dass diese überproportional viele Medaillen in den neuen Wintersportdisziplinen (eingeführt ins Olympische Programm nach 1988) gewonnen haben. An den Winterspielen 2018 wurden 34% der Medaillen in den neuen Disziplinen (z.B. Ski Freestyle, Snowboard, Short Track und Curling) verteilt. Südkorea (KOR) war die erfolgreichste aufstrebende Wintersportnation und gewann 53% seiner 17 Medaillen in neuen Sportdisziplinen, gefolgt von China (CHN) 78% (9 Medaillen) und Grossbritannien (GBR) 100% (5 Medaillen).

Weiter zeigt sich, dass die Top-5-Nationen im Medaillenspiegel 2018 unterschiedliche Sport-Portfolios haben. Norwegen (NOR) gewann seine 39 Medaillen primär in den nordischen Disziplinen und im Alpin Ski, Deutschland (GER) seine 31 Medaillen überwiegend in den kleinen traditionellen Sportarten wie Rodeln, nordische Kombination und Bob, während Kanada (CAN) (29 Medaillen) und die USA (23 Medaillen) ihre Medaillen in den neuen Disziplinen Snowboard und Ski Freestyle gewannen. Schlussendlich gewann die Niederlande den Grossteil an Medaillen in der Disziplin Eisschnelllauf.

Discussion/Conclusion:

Aufgrund der durch das IOC und die internationalen Wintersportverbände gesteuerten Veränderungen im Olympischen Programm sind die Nationen gefordert zu reagieren. Durch die Ausdifferenzierung des Olympischen Programms sind klassische Ski-Alpin-Nationen wie die Schweiz und Österreich gefordert, neue Marktpotentiale in verwandten Disziplinen (z.B. Snowboard, Ski Freestyle) zu erschliessen. Es zeigt sich weiter, dass durch die Ausweitung des Programms neue Nationen im Medaillenspiegel vorstossen, welche diese neuen Medaillen Chancen wahrnehmen. Dazu zählen insbesondere asiatische Wintersportnationen wie Südkorea und China sowie Grossbritannien und Neuseeland. Schlussendlich zeigt das Sport-Portfolio der Top-5-Nationen in PyeongChang 2018, dass sich diese Nationen die Disziplinen untereinander «aufteilen».

Vergleichbar mit den strategischen Grundvarianten für Firmen von Michael E. Porter (1998) lassen sich die Erfolge der Top-5-Nationen in eine Differenzierungs-Strategie (NOR, GER, CAN, USA) und eine Fokus-Strategie (NED) einteilen, während die aufstrebenden (KOR, CHN, GBR) eine Differenzierungs-Strategie gegeben über den etablierten Wintersportnationen (SUI, AUT, FIN) im Medaillenspiegel aufweisen.

Durch Fallstudien dieser Nationen kann in weiterführenden Forschungsprojekten eruiert werden, inwiefern diese identifizierten, strategischen Positionen an den Olympischen Winterspielen eine Konsequenz von strategischen Entscheidungen sind oder inwiefern diese Positionen eher auf eine «natürliche Weise», im Sinne einer «Laissez-faire-Strategie», zustande gekommen sind.

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Exhibitors

Friday 15.02.2019

13:15 Workshops exhibitors

G140

G120

G230

Prophysics & Kistler

Neurolite

Neurolite:

Functional near-infrared spectroscopy (NIRS)

Artinis develops NIRS devices that enable you to non-invasively monitor haemoglobin concentration changes in muscle and brain tissue. For sports research we offer portable, user-friendly and affordable NIRS devices that can be used in the lab and in the field. During the NIRS workshop we will give a general introduction into the principles of NIRS, followed by a demonstration of the PortaMon, our muscle oxygenation monitoring device, and the Brite23, our brain oxygenation monitoring device.

Prophysics & Kistler:

Control your Performance

Sportliche Höchstleistungen erfordern massgeschneiderte Trainingsmethoden. Um diese zu erarbeiten, braucht es genaue Kenntnisse der entscheidenden sportartspezifischen Leistungsparameter. Diese werden mit Messsystemen von Kistler und prophysics exakt und zuverlässig ermittelt.

Sie erhalten in diesem Workshop einen Einblick, wie die Sprungkraft und Explosivität mit Kistler Kraftmessplatten und der vielseitigen MARS Software erfasst und dargestellt werden. Des Weiteren zeigen wir, wie die Reaktionszeiten und Richtungswechsel mit dem intelligenten Witty Ampel System analysiert werden.