SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Book of Abstracts

« Sport & Big Data » - Challenges and opportunities for sport science

« Sport & Big Data » - Défis et opportunités pour les sciences du sport

13th annual congress of the SGS/4S in Lausanne

09. / 10.02.2022

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Keynotes

Keynote 1:

Playing with Metrics: Self-tracking as Personal Science

Prof. B. Ajana (King's College London)

Keynote 2:

Esports and Virtual Environments: the realm of data?

Prof. N. Besombes (University of Paris Descartes)

Keynote 3:

Disentangling sport, exercise and physical activity in a data-driven world

Prof. B. Kayser (University of Lausanne)

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Symposium

Wednesday 09.02.2022

10:15 – 11:45

Room 2218 **Problématiques actuelles et innovations en Education Physique et Sportive**

Interdisciplinary Teaching with an Exergame: Effects on PE and Mathematics Learning
V. Cece

The Significant Negative Events during Initial Teacher Training: The Case of Physical Education
M. Descoeudres

Teacher Well Being and Perceived School Climate during COVID-19 School Closure: The Case of Physical Education in Switzerland
V. Lentillon-Kaestner

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
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Title:

Interdisciplinary Teaching with an Exergame: Effects on PE and Mathematics Learning

Authors:

Cece V, Fargier P, Bovas, M., Girod, G., Chabloz, E., Lentillon-Kaestner V, & Roure, C.
Teaching and Research Unit in Physical Education and Sport (UER EPS), University of Teacher Education, Sate of Vaud (HEP Vaud), Lausanne.

Abstract:

Introduction: The numeric tools are regularly used at school and some exergames (*i.e.*: active video games) might be useful during physical education (PE) courses to increase the situational interest (Roure, Pasco, Benoît, & Deldicque, 2020) and/or the rate of physical activity (Gao et al., 2017) in students. However, the possible influence of such exergames on learning remained to be studied. Furthermore, some exergames involve mathematical contents while it has been suggested that mathematics and PE might elicit interdisciplinary teaching (Nilges & Usnick, 2000). The present study thus aimed to explore the possible influence of a design-based exergame on the learning of a mathematical task and a motor task.

Methods: 216 Students (11.06±.74 years) were distributed in two groups, and each was engaged in an interdisciplinarity 6-lessons sequence including mathematics and PE contents. During the lessons, the experimental group systematically used the exergame platform Lü® to play video games leading to determine a series of bipolar coordinates and to throw a ball towards each determined coordinate. The control group was also trained to determine such coordinates and to through a ball on a target but did not use any numeric system. During the sequences (lessons 3 and 5), the scores of situational interest (SI) and moderate-to-vigorous activity (MPVA) were measured. At the beginning and at the end of the sequences (lessons 1 and 6), the efficacy to determine bipolar coordinates (DC) and to throw a ball to reach a target (TT) were also measured.

Results: Multivariate analysis of variance showed: (a.) no statistically significant difference in SI scores between the experimental group and the control group at the two measurement times ($p < .05$), and (b.) a higher MPVA score in the control group (vs the experimental group), at lesson 3 ($F = 25.82$, $p < .01$) but no difference between the MPVA scores of the two groups at lesson 5 ($F = 1.10$, $p = .29$). Furthermore, multivariate analysis of covariance showed that the DC scores ($F = 6.65$, $p = .01$) and TT scores ($F = 4.46$, $p = .02$) were better in the experimental group than in the control group, after the learning session.

Discussion/Conclusion: The better DC and TT scores observed in the experimental group might be due to didactical benefits specific to the numerical platform used by this group, but not by the control group (Benzing & Schmidt, 2018), as the two groups did not show clear-cut differences in SI and MPVA scores. Such benefits might be linked to elements related to the used exergames such as: a systematic and accurate attribution of the knowledge of the results, important parametrized repetitions with frequent attentional stimulation and, possibly, the direct link induced between each determined coordinate and the subsequent target to be reached by throwing.

References:

Gao, Z., Pope, Z., Lee, J. E., Stodden, D., Roncesvalles, N., Pasco, D., … Feng, D. (2017). Impact of exergaming on young children's school day energy expenditure and moderate-to-vigorous physical activity levels. *Journal of Sport and Health Science*, *6*(1), 11–16. https://doi.org/10.1016/j.jshs.2016.11.008

Nilges, L., & Usnick, V. (2000). The Role of Spatial Ability in Physical Education and Mathematics. *Journal of Physical Education, Recreation & Dance*, *71*(6), 29-33.

Roure, C., Pasco, D., Benoît, N., & Deldicque, L. (2020). Impact of a Design-Based Bike Exergame on Young Adults' Physical Activity Metrics and Situational Interest. *Research Quarterly for Exercise and Sport*, *91*(2), 309–315. https://doi.org/10.1080/02701367.2019.1665621

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

The Significant Negative Events during Initial Teacher Training: The Case of Physical Education

Authors:

Descoeudres M., Cécé V., & Lentillon-Kaestner, V.

Haute école pédagogique du canton de Vaud, UER d'éducation physique, Suisse; University of teacher education, Vaud, Physical Education unit, Switzerland

Abstract:

Introduction: Physical education (PE) is a subject that stands out from the others, because of the visibility of the actions from all students, the interdependence between students during learning situations and the varied environments (outdoor, pools, ice-skating rings, forest ...). All of these factors contribute to the development of a range of emotions particularly for the early career teacher (Descoeudres & Hagin, 2020). Previous studies suggested that PE teachers are exposed to different well-being outcomes (e.g., Guillet-Descas & Lentillon-Kaestner, 2019), but no study focused on the significant negative events related to the subject taught. This research aims to identify the similarities and the differences between PE students and students of other subjects during their first year of teaching their specialist subject with a focus on the negative events.

Methods: 167 Swiss students (Mage = 28.68 ± 5.78 years, 99 males and 68 females) took part in the study. At the time of the data collection, all students frequented lectures about learning to teach in secondary schools at the Institute of Teaching Education of the Canton of Vaud. The students were studying modules in PE programmes (n = 99) or in other subjects (n = 68). The students reported two emotionally significant situations using a narrative questionnaire. The significant professional events were encoded in five categories named "Rules violation from students", "Collaborative issues", "Risk for physical integrity", "Organisational issues", and "Unmotivated behaviours". The students also reported their levels of negative emotions, professional burnout (including physical fatigue, cognitive weariness, and emotional exhaustion), and professional vigour (i.e., physical strength, cognitive liveliness, and emotional energy). A series of Chi-Square tests and Mann-Whitney U tests were performed to compare the outcomes of PE students in comparison with teachers of other subjects.

Results: The Chi-Square tests showed significant differences in the distribution of significant events classes between PE students and students teaching other subjects (χ^2 (4) = 11.93, $p < .05$). PE students were particularly associated with "risks for physical integrity" and "unmotivated behaviours". The "collaborative issues" were more reported by students of other subjects. Moreover, the Mann-Whitney U tests revealed that PE students were associated with significantly lower levels of physical fatigue ($p < .05$) and cognitive weariness (marginally, $p = .06$) and significantly higher physical strength ($p < .05$).

Discussion/Conclusion: This study confirmed that the specific factors related to PE lead to specific significant negative events for PE students during initial training. We could assume that the social and visible behaviours of students in PE highlight the unmotivated behaviours in comparison to other subjects. Moreover, the students' movements should logically explain the important mention of "Risks for physical integrity" for PE students. The better well-being levels of PE students is in line with previous studies and could be related to their specific pedagogical expertise (Guillet-Descas & Lentillon-Kaestner, 2019) but also to collaborative support (Cece et al., in press).

References:

Cece, V., Guillet-Descas, E., & Lentillon-Kaestner, V. (in press). Teacher Well-Being and Perceived School Climate during COVID-19 School Closure: The Case of Physical Education in Switzerland. *The teacher educator*.

Descoeudres, M. & Hagin, V. (2020). Emotionally Significant Situations Experienced by Physical Education Teachers in Training. *Revista de Psicologìa del Deporte / Journal of Sport Psychology, 29*(5), 150-155.

Guillet-Descas, E., & Lentillon-Kaestner, V. (2019). Burnout et engagement chez les enseignants du secondaire: Une comparaison femmes/hommes. *Revue Education & Formation, 99*, 71–86.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Teacher Well Being and Perceived School Climate during COVID-19 School Closure: The Case of Physical Education in Switzerland

Authors:

Lentillon-Kaestner, V[1], Cece, V[1], Guillet-Descas E[2].

[1]Teaching and Research Unit in Physical Education and Sport (UER EPS), University of Teacher Education, Sate of Vaud (HEP Vaud), Lausanne, Switzerland

[2]University of Claude Bernard Lyon 1 – University of Lyon, Laboratory of Vulnerabilities and Innovation in Sport (EA 7428), Interdisciplinary Confederation of Research in Sport (FED 4272), Lyon, France

Abstract:

Introduction: School closure and distance learning during the COVID-19 lockdown had the potential to affect teachers' perception of their well-being and of the school climate. Within the teaching community, physical education (PE) teachers particularly redesigned their activities during school closures, posing both opportunities and threats. The study aim was to contribute to the understanding of the teachers' well-being experiences (burnout and engagement) and school climate perceptions during the lockdown for PE teachers in comparison with those of teachers of other subjects.

Methods: The sample consisted of 188 secondary school teachers from the state of Vaud in Switzerland (*M* = 38.41 years, *SD* = 13.92). One hundred eighteen teachers participated in the 2016-2017 school year, which was considered a typical year, and 70 participated in the 2019-2020 school year during the lockdown period. Teachers completed a questionnaire assessing burnout (three dimensions: physical fatigue, cognitive weariness, emotional exhaustion) (Sassi & Neveu, 2010), engagement (three dimensions: physical strength, cognitive liveliness, emotional energy) (Isoard-Gautheur et al., 2020), and perceived school climate (Johnson et al., 2007) (e.g., collaboration, student relations, decision making). A 2*2 (school year*school subject) multivariate analysis of covariance (MANOVA) was used on the dimensions of burnout, engagement, and teachers' perceptions of school climate.

Results: The results revealed better psychological experiences among PE teachers in 2020 compared to those in a traditional year and compared to those of teachers of other subjects. School closure was related to higher collaboration, vigour scores and lower levels of physical fatigue for PE teachers.

Discussion/Conclusion: The positive results of this study for PE teachers suggests using profits of the COVID-19 period in normal teaching conditions.

References:

Isoard-Gautheur, S., Ginoux, C., Heuzé, J.-P., Tessier, D., Trouilloud, D., Guillet-Descas, E., & Sarrazin, P. (2020). Construct Validity of the French Shirom-Melamed Vigor Measure (F-SMVM): A Multitrait-Multimethod (MTMM) Approach. *European Journal of Psychological Assessment*, *36*(2), 372–386. https://doi.org/10.1027/1015-5759/a000518

Johnson, B., Stevens, J. J., & Zvoch, K. (2007). Teachers' Perceptions of School Climate: A Validity Study of Scores From the Revised School Level Environment Questionnaire. *Educational and Psychological Measurement*, *67*(5), 833–844. https://doi.org/10.1177/0013164406299102

Sassi, N., & Neveu, J.-P. (2010). Traduction et validation d'une nouvelle mesure d'épuisement professionnel: Le shirom-melamed burnout measure. *Canadian Journal of Behavioural Science / Revue Canadienne Des Sciences Du Comportement*, *42*(3), 177–184. https://doi.org/10.1037/a0017700

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SOCIETE SUISSE DES SCIENCES DU SPORT

Symposium

Wednesday 09.02.2022

13:30 – 14:50

Room 2212 **International Participatory and Data-based Approaches to Empower Children, Adolescent and Adult Health Behavior Change**

Chair: U. Pühse & M. Gerber

Introduction
U. Pühse & M. Gerber

Empowering adolescents to lead change using health data: Describing an international participatory and data-based intervention development approach
CR. Nigg

Impact of a school-based physical activity and micronutrient supplementation intervention on body composition among primary schoolchildren from South Africa, Tanzania, and Côte d'Ivoire: Results from the *KaziAfya* study
K. Long

Collecting health and wellbeing data in under-resourced settings to facilitate behaviour change. Examples from the *KaziHealth* school-based workplace health intervention program
N. Joubert

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
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Title:

Empowering adolescents to lead change using health data: Describing an international participatory and data-based intervention development approach

Authors:

Nigg CR[1], Haddad S[1], Jaggi J[1], Guthold R[2]

[1]Department of Health Science, Institute of Sport Science, University of Bern, Switzerland

[2]Maternal, Newborn, Child and Adolescent Health and Ageing Department, WHO, Geneva, Switzerland

Abstract:

Introduction: The aim of this project is to develop, document, support, and evaluate the effectiveness of the implementation of an intervention approach to improve the health of 13-17 year old students in four selected cities (Sekondi-Takoradi, Ghana; Jaipur, India; Spanish Town, Jamaica; and Fez, Morocco) using locally collected data.

Methods: The data informing the intervention approach is collected through two surveys: The health-related data collected in schools via the Global School-based Student Health Survey (GSHS; WHO, n.d.a) and the Global School Health Policies and Practices Study (G-SHPPS; WHO, n.d.b). Additionally, these data are enhanced with photovoice by students, who represent 15 schools per city, along with stakeholder (including adolescent) input from each city.
An interactive workshop is conceptualized to develop the intervention action plan. During the workshop and based on the findings of the above data sources, the Global Accelerated Action for the Health of Adolescents (Global AA-HA!, 2017) approach and Global Standards for Health Promoting Schools (WHO, n.d.c) will be used to:

- identify adolescent health needs through exploring the collected data;
- assess policies, systems/structures and practices already in place; and
- identify gaps and needs for action to improve health

in order to develop an action plan which will then be implemented in the subsequent 2 years.

Results: Thus, using the AA-HA! intervention menu and relevant published reviews of effective interventions, students, teachers, and local stakeholders will work together to identify and prioritize policy, system/structure and program solutions based on the data sources' results. By the end of the workshop, the different participants will establish a unified intervention plan and logic model to be implemented and how they will report back/evaluate on the proposed interventions.

Discussion/Conclusion: The participatory, data and evidence informed approach will maximize buy-in, empowerment, cultural appropriateness, intervention localization and thus effectiveness.

Funded by: Botnar Fundation

References:

World Health Organization. (n.d.a). Global School-based Student Health Survey (GSHS). Retrieved October 25, 2021, from https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/global-school-based-student-health-survey

World Health Organization. (n.d.b). Global School Health Policies and Practices Survey (G-SHPPS). Retrieved October 25, 2021, from https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/global-school-health-policies-and-practices-survey

World Health Organization. (n.d.c). Global Standards for Health Promoting Schools. Retrieved October 26, 2021, from https://www.who.int/health-topics/health-promoting-schools#tab=tab_1

Global Accelerated Action for the Health of Adolescents (AA-HA!): guidance to support country implementation. Geneva: World Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Impact of a school-based physical activity and micronutrient supplementation intervention on body composition among primary schoolchildren from South Africa, Tanzania, and Côte d'Ivoire: Results from the *KaziAfya* study

Authors:

Long K[2], Beckmann J[1], Lang C[1], Müller I[1], Nqweniso S[4], Probst-Hensch N[2], Pühse U[1], Seelig H[1], Steinmann, P[2], Utzinger J[2,3], Walter C[4], Gerber M[1]

[1] Department of Sport, Exercise and Health, University of Basel, Switzerland;
[2] Swiss Tropical and Public Health Institute, Switzerland;
[3] University of Basel, Switzerland;
[4] Nelson Mandela Metropolitan University, South Africa

Abstract:

Introduction: The prevalence of overweight and obesity is increasing among children worldwide, which potentially predisposes them to greater obesity and non-communicable diseases (NCDs) in adulthood. These trends are complicated by associations of overall and abdominal fat with impaired growth among children in LMICs, which may further increase risk of obesity. The effects of school-based physical activity (PA) promotion and multi-micronutrient supplementation (MMNS) intervention on body composition were assessed among primary schoolchildren from South Africa, Tanzania, and Côte d'Ivoire, enrolled in a longitudinal school-based randomized controlled trial.

Methods: In 2019, data of 1300 primary schoolchildren, aged 6-12 years old, from four public schools located in marginalized areas were collected in Gqeberha region (South Africa), in February (baseline) and in September as part of the *KaziAfya* intervention trial. Children were randomized to one of four groups: (a) a physical activity group (PA); (b) a multi-micronutrient supplementation group (MMNS); (c) a physical activity + multi-micronutrient supplementation group (PAMNS); and (d) control group, and are being followed for three years. A linear random effects regression model tested associations of each intervention arm with overall fat mass (FMkg), fat free mass (FFM), truncal fat mass (TrFM) and truncal fat free mass (TrFFM) at nine months (T2) and explored these differences among children who differed in height velocity (HV).

Results: Promotion of PA was associated with reduced FM and TrFM among children at T2, while increased FFM was found among children in the MMNS group. Children in the MMNS arm with lower HV had reduced FM compared to children in the non-intervention arm, while children in the PA arm had reduced FM. Similarly, children with lower HV in the MMNS and PA groups had reduced TrFM compared to children in the non-intervention arm.

Discussion/Conclusion: Public health efforts to reduce overweight and obesity among children in LMICs should promote PA in schools and consider MMNS of children with reduced growth trajectories.

References:

Saklayen, M.G. The global epidemic of the metabolic syndrome. Curr. Hypertens. Rep. 2018, 20, 12.

Sawaya Al Grillo, L.P.; Verreschi, S.I.; da Silva, A.C.; Roberts, S.B. Mild stunting is associated with higher susceptibility to the effects of high fat diets: Studies in a shantytown population in São Paulo, Brazil. J. Nutr. 1998, 128 (Suppl. 2), 415S–420S.

Bénéfce, E.; Garnier, D.; Simondon, K.B.; Malina, R.M. Relationship between stunting in infancy and growth and fat distribution during adolescence in Senegalese girls. Eur. J. Clin. Nutr. 2001, 55, 50–58.

Schroeder, D.G.; Martorell, R.; Flores, R. Infant and child growth and fatness and fat distribution in Guatemalan adults. Am. J. Epidemiol. 1999, 149, 177–185.

Walker, S.P.; Gaskin, P.S.; Powell, C.A.; Bennett, F.I. The effects of birth weight and postnatal linear growth retardation on body mass index, fatness and fat distribution in mid and late childhood. Public Health Nutr. 2002, 5, 391–396.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Collecting health and wellbeing data in under-resourced settings to facilitate behaviour change. Examples from the *KaziHealth* school-based workplace health intervention program

Authors:

Joubert N[1,2,3], Adams L[4], Aerts A[5], Botha J[6], Degen J[3], Gall S[3], Müller I[3], Nienaber M[4], Nqweniso S[4], Pr obstHensch N[1,2], du Randt R[4], Seelig H[3], Dolley D[4], Steinmann P[1,2], Veldsman A[6], Walter C[4], Utzinger J[1,2], Pühse U[3], Gerber M[3], van Greunen D[6]

[1]Swiss Tropical and Public Health Institute, Basel, Switzerland;
[2]University of Basel, Basel, Switzerland;
[3]Department of Sport, Exercise and Health, University of Basel, Basel, Switzerland;
[4]Department of Human Movement Science, Nelson Mandela University, Gqeberha, South Africa;
[5]Novartis Foundation, Basel, Switzerland;
[6]Centre for Community Technology, Nelson Mandela University, Gqeberha, South Africa

Abstract:

Introduction: Available data within LMICs indicate that the disease profile is moving towards a profile seen in more Westernised countries, where more deaths are being attributed to chronic NCDs. With most of the risk factors preventable through healthy lifestyle behaviours, more emphasis needs to be placed on primary prevention strategies. One way to address this is to incorporate health promotion interventions within already established workplace structures. Although massive increases in data and analysis have occurred in many fields over the last decade, data still lacks within LMICs, especially health data. Barriers to health data collection, profiling, and exchange, have been attributed to poor infrastructure, lack of training and insecurity (Akhlaq et al., 2016). As health behaviour interventions rely on initial health data and profiling as a fundamental starting point, it is important to address difficulties surrounding health data handling within lower-resourced settings (Michie et al., 2011).

Methods: The *KaziBantu* project, 'Healthy Schools for Healthy Communities', is implemented in primary schools in low resourced settings within South Africa's poorest province, the Eastern Cape. The project aims to promote physical activity and healthy lifestyle behaviour in both schoolchildren, through the *KaziKidz* toolkit, and their teachers, through *KaziHealth*, a workplace health intervention program (Müller et al., 2019). *KaziHealth* consists of five steps: risk assessment, health risk profiling, lifestyle coaching, self-monitoring and evaluation of goals achieved. The *Kazi*-Comprehensive Health Assessment Tool, or *KaziCHAT* for short, was developed to ease the assessment, profiling, and storage of health and wellness data within *KaziHealth*. *KaziCHAT* has the ability to track longitudinal data, and provide a summary to the participant, which can be accessed with an easy-to-use cell phone application. *KaziCHAT* further allows interdisciplinary healthcare team to collaborate and share patient data.

Results: The *KaziCHAT* platform has the functionality to store and rate body composition, cardiometabolic risk factors, physical activity and fitness data, psychosocial health and parasitology data. Each category has various assessment methods, depending on availability within the settings. A random glucose sample or a full glycosylated haemoglobin assessment can be used, depending on availability and need, for example. To date, a total of 500 health profiles has been captured, each with around 400 data points, within the *KaziCHAT* platform.

Discussion/Conclusion: Although LMIC populations have been identified as having a high risk of NCDs, little is known about risk factors present, health behaviours practised and the effectiveness of interventions to improve these. An important gap in the literature will be addressed by examining these risk factors and determining the efficacy of a workplace health intervention programme in primary school settings with the help of the *KaziCHAT* platform.

References:

Akhlaq, A., McKinstry, B., Muhammad, K. Bin, Sheikh, A., 2016. Barriers and facilitators to health information exchange in low- and middle-income country settings: A systematic review. Health Policy Plan. 31, 1310–1325. https://doi.org/10.1093/heapol/czw056

Michie, S., van Stralen, M.M., West, R., 2011. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. Implement. Sci. 42. https://doi.org/doi:10.1186/1748-5908-6-42

Müller, I., Smith, D., Adams, L., Aerts, A., Damons, B.P., Degen, J., . . ., Pühse, U., 2019. Effects of a school-based health intervention program in marginalized communities of port elizabeth, South Africa (the kazibantu study): Protocol for a randomized controlled trial. JMIR Res. Protoc. 8, 1–17. https://doi.org/10.2196/14097

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Symposium

Wednesday 09.02.2022

13:30 – 14:50

Room 1216 **Hypoxia Exposure: a Double-edge Blade for Patients**

Chair: G. Millet

Risks and benefits of hypoxia in individuals with pulmonary disorders

A. Raberin

Hypoxic ventilatory responses in preterm vs full-term born adults

G. Manferdelli

A role of hypoxia in Parkinson's Disease?

J. Burtscher

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Risks and benefits of hypoxia in individuals with pulmonary disorders

Authors:

Raberin A[1], Millet GP[1].

[1]Institute of Sport Sciences, University of Lausanne, Lausanne, Switzerland.

Abstract:

Introduction: Pulmonary diseases are one of the five leading causes of mortality, and are often associated with cardiovascular disorder and mainly pulmonary hypertension (Gredic et al., 2021). The potential of hypoxia as a therapeutical intervention for cardiovascular diseases has been recently highlighted (Mallet, Burtscher, Richalet, Millet, & Burtscher, 2021). While hypoxic conditioning represents a promising therapeutic strategy for several diseases, hypoxia remains a specific environment inducing a cascade of adaptations that depend mainly on the dose (i.e. severity x exposure duration) of the stimuli. For patients with pulmonary disease, even a low hypoxic dose could have deleterious effects. Among them, hypoxia induced pulmonary vasoconstriction that exacerbate pulmonary hypertension and sympathetic activation. Therefore, exposure to hypoxia represent a challenge in patient with pulmonary disease. The purpose of this talk is to understand the risks-benefits balance of hypoxia conditioning or exposure in individual with pulmonary diseases.

Methods: Systematic research in biomedical literature database was conducted, with an emphasis on interventional studies at moderate altitude on individual with pulmonary disorders.

Results: It was reported that vasoconstriction occurs in healthy subjects with or without pulmonary troubles, throughout 5 days of exposure at moderate altitude (Raberin et al., 2020). Other studies confirmed that hypoxia is harmful for pulmonary patients (Georges et al., 2021). Contradictory hypoxia was associated to an improved patient's quality of life (Fakhri et al., 2020). Overall, these conflicting reports highlight the need for further study to investigate this "paradox of hypoxia" and to determine the optimal hypoxic dose in pulmonary patients.

Discussion/Conclusion: Although exposureto hypoxia triggers beneficial adaptations for cardiovascular health, it also worsens pathophysiological mechanisms of pulmonary diseases. However, recent observations reported that low dose of hypoxia could be well tolerated, inducing benefits for risk factors associated to pulmonary diseases.

References:

Fakhri, S., Hannon, K., Moulden, K., Peterson, R., Hountras, P., Bull, T., … Badesch, D. (2020). Residence at moderately high altitude and its relationship with WHO Group 1 pulmonary arterial hypertension symptom severity and clinical characteristics: The Pulmonary Hypertension Association Registry. Pulmonary Circulation, 10(4), 2045894020964342.

Georges, T., Le Blanc, C., Ferreol, S., Menu, P., Dauty, M., & Fouasson-Chailloux, A. (2021). Effects of Altitude on Chronic Obstructive Pulmonary Disease Patients: Risks and Care. Life, 11(8), 798.

Gredic, M., Blanco, I., Kovacs, G., Helyes, Z., Ferdinandy, P., Olschewski, H., … Weissmann, N. (2021). Pulmonary hypertension in chronic obstructive pulmonary disease. British Journal of Pharmacology, 178(1), 132 151.

Mallet, R. T., Burtscher, J., Richalet, J.-P., Millet, G. P., & Burtscher, M. (2021). Impact of High Altitude on Cardiovascular Health: Current Perspectives. Vascular Health and Risk Management, 17, 317 335.

Raberin, A., Nader, E., Ayerbe, J. L., Mucci, P., Connes, P., & Durand, F. (2020). Evolution of blood rheology and its relationship to pulmonary hemodynamic during the first days of exposure to moderate altitude. *Clinical Hemorheology and Microcirculation*, *74*(2), 201-208.

SPORTWISSENSCHAFTLICHE
SOCIETE SUISSE DES
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SCIENCES DU SPORT

Title:

Hypoxic ventilatory responses in preterm vs full-term born adults.

Authors:

Manferdelli G[1*], Narang BJ[2,3*], Debevec T[2,3#], Millet GP[1#].

[1]Institute of Sport Sciences, University of Lausanne, Switzerland.

[2]Department of Automation, Biocybernetics and Robotics, Jožef Stefan Institute, Slovenia.

[3]Faculty of Sport, University of Ljubljana, Slovenia.

* These authors share the first author position. # These authors share the last author position.

Abstract:

Introduction: Premature birth is known to induce several physiological alterations both at rest and during exercise (Duke & Lovering, 2020). The cardiorespiratory system seems to be the most affected by prematurity, even though previous research has shown that hypoxia in combination with exercise may mitigate the differences between preterm adults and full-term peers (Debevec et al., 2019). The aim of this study was to investigate the hypoxic ventilatory responses (HVR) as well as the cardiorespiratory responses to maximal test in both normoxia and hypoxia in healthy preterm and full-term adults.

Methods: Fifteen prematurely born (Mean±SD; age, 21±4 years; height, 180±9 cm; body mass, 73.4±15.0 kg; gestational age, 29±2 weeks; gestational mass, 1169±260 g) and seventeen full-term (age, 21±2 years; height, 182±6 cm; body mass, 75.6±6.9 kg; gestational age, 40±1 weeks; gestational mass, 3621±418 g) adults underwent a pure nitrogen breathing test (Edelman, Epstein, Lahiri, & Cherniack, 1973) to determine their HVR as the slope of the minute ventilation (V̇E) plotted against peripheral oxygen saturation (SpO2) generated during a series (n= 10) of 100% inspired nitrogen exposures (1–8 consecutive breaths). Subsequently, participants completed two incremental cycling tests to exhaustion, one in normoxia (295 m, PB=733.5±3.4 mmHg) and the other in hypobaric hypoxia (3375 m, PB=503.1±2.7 mmHg). Gas exchanges and SpO2 were continuously measured during each the test.

Results: HVR was similar between preterm and full-term adults (-0.395±0.264 vs. -0.270±0.121 L/min/%, p=0.09). At rest, preterm adults had a lower (p=0.04) hypoxia-induced desaturation (from 99±1% to 95±2%) than the full-term participants (from 99±0% to 94±2%). At peak, hypoxia significantly decreased oxygen uptake (V̇O2peak) and SpO2 in both preterm and full-term adults to a similar extent (-23±11% vs. -26±8%, p<0.0001, and -9±7% vs. -13±5%, p<0.0001, respectively), while pulmonary ventilation (V̇E) increased (17±19% vs. 11±12%, p<0.0001). Preterm adults exhibited a lower maximal aerobic power (MAP) than their full-term peers in both normoxia (258±42 vs. 297±51 W, p=0.02) and hypoxia (228±37 vs. 260±38 W, p=0.05). No correlations were found between the percent or absolute decrease in SpO2 and either V̇O2peak or V̇E in both groups. A significant correlation was observed between HVR and both the percent and absolute normoxia-to-hypoxia decrease in V̇O2peak in preterm (r=0.41, p=0.01, r=0.68, p=0.005, respectively) but not in full-term (r=0.22, p=0.39, r=0.08, p=0.76, respectively) participants. No correlations were observed between HVR and either the percentage or absolute changes in V̇E, MAP and SpO2 in both groups.

Discussion/Conclusion: While both preterm and full-term participants exhibited similar hypoxia-induced decreases in $\dot{V}_E$, MAP and SpO_2, the decrease in $\dot{V}O_{2peak}$ was related to HVR in the preterm but not in the full-term adults, suggesting some different adaptation mechanisms between these two groups.

References:

Debevec, T., Pialoux, V., Millet, G. P., Martin, A., Mramor, M., & Osredkar, D. (2019). Exercise Overrides Blunted Hypoxic Ventilatory Response in Prematurely Born Men. Front Physiol, 10, 437. doi:10.3389/fphys.2019.00437

Duke, J. W., & Lovering, A. T. (2020). Respiratory and cardiopulmonary limitations to aerobic exercise capacity in adults born preterm. J Appl Physiol (1985), 129(4), 718-724. doi:10.1152/japplphysiol.00419.2020

Edelman, N. H., Epstein, P. E., Lahiri, S., & Cherniack, N. S. (1973). Ventilatory responses to transient hypoxia and hypercapnia in man. Respir Physiol, 17(3), 302-314. doi:10.1016/0034-5687(73)900054

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

A role of hypoxia in Parkinson's Disease?

Authors:

Burtscher J[1,2], Millet GP[1].

[1]Institute of Sport Sciences, University of Lausanne, Lausanne, Switzerland.

[2]Department of Biomedical Sciences, University of Lausanne, Lausanne, Switzerland.

Abstract:

Introduction: Parkinson's Disease (PD) is the second most common neurodegenerative disease after Alzheimer's Disease. The mostly sporadic occurring PD is characterized by a circuit-specific loss of neurons, most notably of dopaminergic neurons in the substantia nigra pars compacta (SNpc) and motor-symptoms that can greatly vary among patients. Mitochondrial dysfunction as well as misfolding and aggregation of the protein alpha-synuclein (aSyn) that leads to Lewy pathology are further hallmarks of PD. These pathologies also present in highly variable forms in sporadic PD-brain and it remains unclear, if they are causally involved in disease progression (Burtscher, Syed, Keller, Lashuel & Millet, 2021). The aim of this talk is to lay out the evidence of a role of hypoxia in PD and to propose possibilities to render the brain more resilient to hypoxic insults.

Methods: Extensive literature searches were performed to evaluate the role of hypoxia in neurodegenerative disease pathogenesis, and in particular in PD.

Results: Based on reported benefits of interventions related to oxygen level variations in numerous neurological disorders (Burtscher, Burtscher & Millet, 2021), hypoxia conditioning is a promising treatment strategy also for PD, although the dangers of severe hypoxia have to be considered.

We suggest that brain hypoxia may be a central factor in PD pathogenesis (Burtscher, Syed, Lashuel, & Millet, 2021) and may further link mitochondrial dysfunction to aSyn pathology (Burtscher, Syed, Keller, Lashuel & Millet, 2021). Should this assumption hold true, strengthening the adaptive capacity of the brain to tolerate oxygen variation (e.g. by hypoxic/hyperoxic conditioning) would be a promising treatment strategy.

Discussion/Conclusion: Hypoxia conditioning was identified as a potential novel approach to treat PD, probably exerting neuroprotective effects by inducing hormetic adaptations in the brain.

References:

Burtscher, J., Mallet, R. T., Burtscher, M., & Millet, G. P. (2021). Hypoxia and brain aging: Neurodegeneration or neuroprotection? *Ageing research reviews, 68*, 101343.

Burtscher, J., Syed, M. M. K., Keller, M. A., Lashuel, H. A., & Millet, G. P. (2021). Fatal attraction - The role of hypoxia when alpha-synuclein gets intimate with mitochondria. *Neurobiol Aging, 107*, 128-141.

Burtscher, J., Syed, M. M. K., Lashuel, H. A., & Millet, G. P. (2021). Hypoxia conditioning as a promising therapeutic target in Parkinson's disease? *Movement Disorders, 36*, 857-861.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Symposium

Wednesday 09.02.2022

15:50 – 17:10

Room 2212 **Movement Play and Sport Behavior and Motor Development in Childhood and Adolescence- Micro and Macroanalytical Approaches**

Chair: E. Gramespacher

Physical activity in young children during transition from kindergarten to primary school: First findings from the Swiss BeKiPri study
K. Adler

Monitoring of basic motor competencies in childhood and the connection with possible influencing factors
K. Bretz

Social Participation of Children in Integrative Organized Sports: An Analysis of Social Interaction Networks
F. Mumenthaler

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Physical activity in young children during transition from kindergarten to primary school. First findings from the Swiss BeKiPri study.

Authors:

Adler K[1], Gramespacher E[1]

[1]University of Teacher Education FHNW, Switzerland

Abstract:

Introduction: Physical activity (PA) of children is linked to a higher physical and mental health (Janssen & LeBlanc, 2010; Carson et al., 2016). Transition from preschool to 1st grade is a critical stage where PA of children declines (Crane et al., 2018). This can be seen especially in girls (Adler & Gramespacher, 2021). Currently, changes of PA within the transition process to primary school are rare examined.

The aim of the longitudinal Swiss study BeKiPri (physical activity in transition from kindergarten to primary school) is to measure PA, especially of girls and children with migration background in canton of Basel-Stadt. The study also focusses on covariates that determine potential activity changes in transition process.

Methods: Accelerometer data were captured for the first cohort of 2nd year kindergarten children (N = 25; aged five to six) in spring 2021 and after their transition to 1st grade in autumn 2021. The tri-axial GENEActive accelerometer has been evaluated in a pre-study (in cooperation with BASPO; Gilgen-Ammann et al., 2021). Children wore the accelerometer on dominant wrist for seven consecutive days. For data concerning internally and externally personal and activity referred traits, parents and teachers were interviewed by questionnaires – and teachers in addition by oral interviews. Further on, two measurement time points are planned (in spring 2022 and start of 2nd grade, in autumn 2022).

Furthermore, a second cohort (N = 140) will be examined in spring (2nd year of kindergarten) as well as in autumn 2022 (after transition to 1st grade). This is in order to receive a larger sample and to control effects of restrictive corona policies in PA and parental agreement for their child´s activity measurement of first cohort in 2021.

Results: The presentation provides the current state of the art, a study protocol of the ongoing longitudinal study BeKiPri as well as first findings from measures of the first cohort in 2021. By this, we look on extent and intensity of activity behavior before and after transition, especially of girls and students with a migration background. Valid data of accelerometer measurement, questionnaires and interviews at first measurement time point (t1, spring 2021) are available from a small sub-sample.

Discussion: We are looking forward to a critical discussion of researchers' current expectations and beliefs on physical activity in children while coping with transition to primary school.

References:

Adler, K., & Gramespacher, E. (2021). Mädchen im Fokus: Kindliches Aktivitätsverhalten im Übergang Kindergarten – Schule. In K. Adler, & C. Andrä (Hrsg.), *Bewegung, Spiel und Sport bei Kindern im Krippen- und Kindergartenalter* (S. 278–304). Chemnitz: Universitätsverlag Chemnitz.

Carson, V., Huntera, S., Kuzika, N., et al. (2016). Systematic review of physical activity and cognitive development in early childhood. *Journal of Science and Medicine in Sport, 19*, 573–578. doi:10.1016/j.jsams.2015.07.011.

Crane, J.R., Naylor, P.-J., Temple, V.A., et al. (2018). The Physical Activity and Sedentary Behaviour Patterns of Children in Kindergarten and Grade 2. *Children, 5*, 131. doi:10.3390/children5100131.

Gilgen-Ammann, R., Schweizer, T., Dössegger, A., et al. (2021). *Eine Geräteevaluation für Aktivitätsstudien mit fünf- bis zehnjährigen Kindern*. Unveröffentlichter Abschlussbericht. Magglingen: BASPO, EHSM & Windisch: PH FHNW.

Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity, 7*, 40. doi:10.1186/1479-5868-7-40.

SPORTWISSENSCHAFTLICHE
SOCIETE SUISSE DES
GESELLSCHAFT DER SCHWEIZ
SCIENCES DU SPORT

Title:

Monitoring of basic motor competencies in childhood and the connection with possible influencing factors

Authors:

Bretz K[1], Ferrari I[1], Kühnis J[2], Seelig H[3], Keller R[1], Herrmann C[1]
[1]University of Teacher Education Zurich, Switzerland
[2]University of Teacher Education Schwyz, Switzerland
[3]Department of Sport, Exercise and Health, University of Basel, Switzerland

Abstract:

Introduction: Motor development in preschool age (4-6 years) is a central phase, as the basis for the further course of development is laid here. At this age, basic motor competencies (BMC) are acquired and developed. BMC are a central prerequisite for participation in the culture of movement and sport and are anchored in the Swiss curricula. They form the foundation for sport-specific competencies and a physically active lifestyle throughout the lifespan (Hulteen et al., 2018). The development of motor competencies is closely linked to socialization processes in and outside of school (including family, peers, sports club). In addition to developmental influences, different contexts affect the development of BMC. Accordingly, children at comparable levels of physical development have different levels of motor competencies (Herrmann et al., 2021).

Methods: In the MOBAK-Monitoring, funded by the Health Promotion Switzerland (GFCH), the BMC of N = 951 preschool children were assessed by using the MOBAK-KG- instrument (Herrmann et al., 2020). Moreover, the teachers and parents of the children were interviewed by using questionnaires. In 2018, N = 403 children (M = 5.7 years; SD = .56) were assessed in the cantons of Uri and Zurich and N = 548 children (M = 5.7 years; SD = .56) in the cantons of Ticino and Nidwalden in 2020.

Results: When looking at MOBAK performance, there were significant differences between the first and second year of preschool in both competence areas ("object-movement": $p < 0.001$; $d = .96$; "self-movement": $p < 0.001$; $d = .48$). While about one third of the children have a need for support in the first year of preschool, this is significantly lower in the second year of preschool ("object movement": 10 %; "self-movement": 17 %). Differentiated according to gender, it was found that a higher proportion of boys have specific support needs in «self-movement» and a higher proportion of girls in «object-movement». In addition, differences between children from preschools that promote physical activity ("Purzelbaum"-preschools), and regular preschools could be observed. The children from the "Purzelbaum"-preschool achieved a higher score in both competence areas ($p < 0.001$; $d = .04$).

Discussion: In addition to the existing data from 2018/2020, the presentation will include data from the MOBAK-Monitoring 2021 and initial longitudinal results. As part of a SNSF-funded project EMOKK, the children's basic motor competencies will be longitudinally recorded over further four years.

References:

Herrmann, C., Bretz, K., Kühnis, J., Seelig, H., Keller, R., & Ferrari, I. (2021) Motorische Basiskompetenzen im Kindergarten. Monitoring und Zusammenhänge mit Geschlecht, Alter, Gewichtsstatus und bewegungsförderndem Kindergarten (Faktenblatt 55). Bern: Gesundheitsförderung Schweiz.

Herrmann, C., Ferrari, I., Wälti, M., Wacker, S., & Kühnis, J. (2020). MOBAK-KG: Motorische Basiskompetenzen im Kindergarten: Testmanual (3. Auflage). Zürich: Pädagogische Hochschule Zürich. doi:10.5281/zenodo.3774435.

Hulteen, R. M., Morgan, P. J., Barnett, L. M., Stodden, D. F., & Lubans, D. R. (2018). Development of Foundational Movement Skills: A Conceptual Model for Physical Activity Across the Lifespan. Sports Medicine, 48(7), 1533–1540. doi:10.1007/s40279-018-0892-6.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Social Participation of Children in Integrative Organized Sports: An Analysis of Social Interaction Networks.

Authors:

Mumenthaler F[1,2], Steiger A[2], Nagel S[2]

[1]Institute of Special Education, University of Teacher Education Bern, Switzerland

[2]Institute of Sport Science, University of Bern, Switzerland

Abstract:

Introduction: People with disabilities are often found to be at risk of social exclusion. Since the adoption of the Convention on the Rights of Persons with Disabilities (CRPD), in many countries, research efforts have focused on social participation of children with disabilities in the school context. However, the CRPD does not only aim to ensure social participation in school but in all life domains (e.g., CRPD, article 30). Still, research in other life domains, such as sports, remains limited.

In this study, we investigate social interactions in organized sports groups. We analyze which factors are relevant for social interactions. Athleticism is often thought to be a facilitator, whereas intellectual disabilities (ID) or inferior language skills seem to hinder social participation. In network studies, homophily is often found to be a dominant social mechanism. Next to individual attributes, we therefore also consider dyadic structures such as gender homophily and similarity in athletic ability. A specific interest lies in the moderator effects of these networks. Here, the type of sports (team or individual sports), the level of ambition (competitive or non-competitive), or the gender of children with ID might affect the relevance of the factors considered.

Methods: The full sample consists of 31 integrative organized sports groups from the German-speaking part of Switzerland. Two sports groups are excluded from the analysis because the groups were too small and exponential random graph models (ERGMs) did not converge. 31% of the children are girls and 82.5% speak Swiss-German or German at home. Of the 29 sports groups, 17 are in team sports and 18 participate in competitions. Every group was analyzed using the R package *ergm.count*. ERGMs include network structures (e.g., reciprocity) and exogenous factors (e.g., athletic ability, language, and ID). Then, meta-analyses were calculated with the resulting ERGMs for the three factors of interest (gender of child with ID, type of sports, level of ambition).

Results: In general, children with ID do not receive significantly lower social interaction ratings than children without ID. Children that have higher athletic ability receive higher social interaction ratings. Further, networks in sports groups are structured by homophily, i.e., children with a similar level of athletic ability interact more with each other. In sports groups with competition, similarity in athletic ability is more important for social interactions than in non-competitive sports groups, i.e., in sports groups that participate in a competition, more athletic children prefer to interact more with other more athletic children. The same goes for less athletic children. Also, children with higher athletic ability receive more social interactions than less athletic children in these groups. In team sports, children speaking Swiss-German or German at home receive more social interactions than children in individual sports. Social interactions of children with ID were not moderated by any of the investigated factors.

Discussion/Conclusion: The results suggest that social interactions are distributed based on athletic ability, consequently they show a meritocratic principle. Neither ID nor language or gender proved to be important factors. Therefore, we find no evidence for social exclusion of children with ID in organized sports. The results for the moderator variables indicate that sports groups are more ambitious when they participate in competitions, and, therefore, athletic ability is more important in this setting. In team sports, socializing is very important, so language skills are more important there than in individual sports.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Symposium

Wednesday 09.02.2022

15:50 – 17:10

Room 1216 **The 300 members of the international Olympic committee from 1894 to 1972**

Pierre de Coubertin's Olympic Diplomacy (1894-1925)
P. Clastres

Recruiting after the War: IOC strategies under the presidency of Sigfried Edström (1942-1952)
F. Carpentier

The Latin-American IOC members during the Avery Brundage presidency (1952-1972)
H. Klima

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Pierre de Coubertin's Olympic Diplomacy (1894-1925)

Authors:

Patrick Clastres

Professor at the Faculty of Social and Political Sciences and coordinator of the *Global Sport & Olympic Studies Center*, University of Lausanne, Switzerland

Abstract:

By crossing the rhythms of the history of emerging international sport and interstate relations, it will be a question of understanding and identifying the reasons and criteria that guide the successive processes of IOC members' cooptation between 1894 and 1925: national origins, role in the field of international sport, diplomatic skills, social and political influence…

We must consider Pierre de Coubertin as the inventor of liberal pacifism by the sport. As evidenced by his speech of November 23, 1892, he was indeed the first to have theorized sporting meetings between athletes and clubs from different countries as a manifestation of free trade and a patriotic contribution to international peace. The encroachments of states like Greece in 1896 and 1906 or France in 1900, and also of the organizers and entrepreneurs of shows in Saint-Louis in 1904 or in London in 1908, lead him to clarify his "Olympic idea" in the Olympic Review, the eponymous magazine he launched in 1901. His Olympism (he does not use the term before 1910) is not only a matter of pure ideas, it is also a promise of action in the field of international relations.

Pierre de Coubertin dreams of being an outsider diplomat in the sense that he does not act on behalf of a particular state, even France, but that he imagines weighing on the fate of the world. His sporting geography (1912) traces the contours of a world parallel to the Westphalian universe of states: the planet of sporting peoples who achieve nation status through their vitality and athletic prowess. This is why, in 1908, he came to formalize his theory of the "trustees of the Olympic idea" by virtue of which the members of the international Olympic committee do not represent their country within the IOC, but on the contrary represent the IOC within their own country.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Recruiting after the War: IOC strategies under the presidency of Sigfried Edström (1942-1952)

Authors:

Florence Carpentier

Associate professor, University of Rouen, France and SNF senior researcher, University of Lausanne, Switzerland

Abstract:

During the 10 years of the presidency of the Swede Sigfried Edström (1942-1952), 48 members were recruited, which amounts to having renewed two thirds of the IOC. Between 1939 and 1945, the number of the IOC members felt from 71 to 51. If two of them died because of the war, the others were too old for conscription, or sufficiently senior not to be exposed to fighting. The purpose of this communication is therefore to understand the turnover of the Olympic leaders that took place from 1945. What are the causes of departures, during the war and after the end? What motivated the many co-options between 1945 and 1952? Thanks to the IOC archives in Lausanne (correspondence of the members, minutes of the meetings) and to the biographical research carried out within the framework of the project, we note that the composition of the post-war IOC is relevant for the leaders, close to the Nazi Germany and the Axis forces, a crucial issue for the survival of the institution in the new world of 1945. If two exclusions are pronounced under pressure from the Allies - but against the wish of Edström, resignations seem encouraged unofficially following other logics. It is the same for the co-optations. If desired recruitments, such as that of Carl Diem, could not be made, others made it possible to strategically prepare the imminent feared entry of the USSR into the Olympic movement, or the English-speaking turn of the IOC.

SPORTWISSENSCHAFTLICHE
SOCIETE SUISSE DES
GESELLSCHAFT DER SCHWEIZ
SCIENCES DU SPORT

Title:

The Latin-American IOC members during the Avery Brundage presidency (1952-1972)

Authors:

Helena Klima

SNF doctoral student, University of Lausanne, Switzerland

Abstract:

As part of this project the ambition of my research is found in the prosopography of the 69 members co-opted within the IOC during the presidency of the American Avery Brundage (1952-1972) and the 68 ones he inherited from his predecessors. Among the 22 Latin-Americans concerned, I will focus on the 15 ones co-opted during 1952 and 1972 and issued from 10 different nations[1].

Reconstructing the life stories of the Latin American members of the IOC not only offers the possibility of painting a collective picture and finding out their common denominator(s), but also the institutional functioning of the IOC, such as the specific co-optation mechanism for Latin American members or how Brundage dealt with the political interference in Olympic sport that took place in most Latin American countries.

A first outcome of this research, is the fact that the IOC influences the usual governmental *intervenciones* in Latin American countries after a *coup d'état*, often involving the NOC, by threatening to withdraw recognition from the NOC and not to allow the country's athletes to participate in the Olympic Games. It turns however, this non-conformity with the Olympic rule of independence of the State, is only punished if the new regime does not comply to the values of the IOC.

[1] Enrique Alberdi Tilloy (1952-1959) and Mario Negri (1960-1974) from Argentina, Jean-Marie Havelange (1963-2011) and Sylvio de Magalhaes Padilha (1964-1995) from Brazil, Alejandro Rivera Bascur (1955-1985) from Chile, Julio Gerlein Comelin (1952-1986) from Colombia, Agustín Arroyo Yerovi (1968-1999) from Ecuador, José Clark Flores (1952-1971) Pedro Ramirez Vasquez (1972-1994) from Mexico, Agustín Sosa (1952-1967) and Virgilio de Leon (1969-1994) from Panama, Eduardo Dibós Dammert (1958-1982) from Peru, Alfredo Imenarrieta Inciarte (1963-1975) from Uruguay, and Julio Bustamante (1952-1968) and José Beracasa Amrán (1968-1981) from Venezuela.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Symposium

Thursday 10.02.2022

14:30 – 15:50

Room 2212 **Metabolic Big Data: Applying Metabolomics to Sport and Exercise Science**

Metabolomics: Assessing the small molecule component of metabolism
J. Ivanisevic

How ceramides orchestrate cardiometabolic health –An ode to physically active living
J. Carrard

Sportomics: Opening perspectives in sport and exercise science
A. Schmidt-Trucksäss

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Metabolomics: Assessing the Small Molecule Component of Metabolism

Authors:

IvanisevicJ[1], Gallart-Ayala H[1], Carrard J[2], Schmidt-Trucksäss A[2], TeavT1, Borreggine R[1], Medina J[1], De Leon A[1]

[1]Metabolomics Unit, Faculty of Biology and Medicine, University of Lausanne, Switzerland

[2]Division of Sports and Exercise Medicine, Department of Sport, Exercise and Health, University of Basel, Switzerland

Abstract: Metabolomics, including lipidomics, is emerging as a quantitative biology approach for the assessment of energy metabolism and information flow through metabolic signalling. Thereby, omic-scale metabolite analysis can provide novel insights into metabolism and its regulation, in health, healthy ageing and disease (Carrard et al., 2021; Gallart-Ayala, Teav, & Ivanisevic, 2020). When combined with genotyping and standardized clinical characterization, the findings can lead to novel mechanistic insights (on metabolic alterations behind disease onset and progression), improved diagnostic potential, and novel therapeutic strategies (Després, 2020). In this presentation, we will provide an overview on the role of metabolomics in this postgenomic era of biochemistry and its application to investigate metabolite role and (bio)activity, from model systems to human population studies. We present the challenges inherent to this analytical science, approaches and modes of analysis that are used to resolve, characterize and measure the infinite chemical diversity contained in the metabolome (along with lipidome) of complex biological matrices (Gallart-Ayala et al., 2020). In the current outbreak of metabolic diseases (i.e. cardiometabolic disorders, cancer and neurodegenerative diseases), metabolomics is ideally situated to bring the disease risk assessment to next level and improve health monitoring by investigation of the effects of lifestyle habits (i.e. diet, physical activity) on metabolism. These habits are amenable to changes and could lead to significantly improved healthy life expectancy or healthspan (vs. lifespan), at a reduced cost compared to disease treatment strategies.

References:

Carrard, J., Gallart-Ayala, H., Infanger, D., Teav, T., Wagner, J., Knaier, R., . . .

Schmidt-Trucksäss, A. (2021). Metabolic View on Human Healthspan: A Lipidome-Wide Association Study. Metabolites, 11(5), 287. Retrieved from https://www.mdpi.com/2218-1989/11/5/287 Després, J.-P. (2020). Predicting longevity using metabolomics: a novel tool for precision lifestyle medicine? Nat Rev Cardiol, 17(2), 67-68. doi:10.1038/s41569-019-0310-2

Gallart-Ayala, H., Teav, T., & Ivanisevic, J. (2020). Metabolomics meets lipidomics: Assessing the small molecule component of metabolism. BioEssays, 42(12), 2000052. doi:https://doi.org/10.1002/bies.202000052

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

How Ceramides Orchestrate Cardiometabolic Health – An Ode to Physically Active Living

Authors:

Carrard J[1], Gallart-Ayala H[2], Weber N[1], Colledge F[3], Streese L[1], Hanssen H[1], Schmied C[4], Ivanisevic J[2], Schmidt-Trucksäss A[1]

[1] Division of Sports and Exercise Medicine, Department of Sport, Exercise and Health, University of Basel, Switzerland

[2] Metabolomics Platform, Faculty of Biology and Medicine, University of Lausanne, Switzerland

[3] Division of Sports Science, Department of Sport, Exercise and Health, University of Basel, Switzerland

[4] Sports Cardiology Section, Department of Cardiology, University Hospital Zurich, University of Zurich, Switzerland

Abstract:

Introduction: Cardiometabolic diseases (CMD) represent a growing socioeconomic burden and concern for healthcare systems worldwide (Lozano et al., 2012). Improving patients' metabolic phenotyping in clinical practice will enable clinicians to better tailor prevention and treatment strategy to individual need (Benziger, Roth, & Moran, 2016). Recently, elevated levels of specific lipid species, known as ceramides, were shown to predict cardiometabolic outcomes beyond traditional biomarkers such as cholesterol (Hilvo, Vasile, Donato, Hurme, & Laaksonen, 2020). Preliminary data showed that physical activity, a potent, low-cost, and patient-empowering means to reduce CMD-related burden, influences ceramide levels (Shepherd et al., 2017). While a single bout of physical exercise increases circulating and muscular ceramide levels, regular exercise reduces ceramide content (Bergman et al., 2015; Dubé et al., 2008). Additionally, several ceramide species have been reported to be negatively associated with cardiorespiratory fitness (Contrepois et al., 2020), which is a potent health marker reflecting training level (Ross et al., 2016). Thus, regular exercise could optimize cardiometabolic health, partly by reversing altered ceramide profiles.

References:

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Sportomics: Opening Perspectives in Sport and Exercise Science

Authors:

Schmidt-Trucksäss A[1], Carrard J1, Ivanisevic J[2].

[1]Division of Sports and Exercise Medicine, Department of Sport, Exercise and Health, University of Basel, Switzerland

[2]Metabolomics Unit, Faculty of Biology and Medicine, University of Lausanne, Switzerland

Abstract: Introduction: Metabolomics is a potent metabolic phenotyping approach, which provides a deep insight into metabolism in both resting and exercising states (Bragazzi, Khoramipour, Chaouachi, & Chamari, 2020). The term "sportomics" was recently introduced and defined as the application of metabolomics in sport and exercise science to investigate the metabolic effects of physical activity (Bongiovanni et al., 2019). As the end-products of biochemical reactions, metabolites reflect the physiological state of the body at a given time (Bragazzi et al., 2020). Thus, analysing changes in the metabolome (i.e. the complete set of low molecular weight molecules found within a biological system) in response to an exercise intervention provides a metabolic fingerprint of this response (Bongiovanni et al., 2019). Sportomics has been applied to monitor training adaptation in soccer players (Pintus et al., 2021), to investigate molecular training adaptation in canoeists (Coelho et al., 2016), to characterize cardiorespiratory capacity within elite endurance athletes (Monnerat et al., 2020) or to study molecular response to acute exercise in nonathletes (Contrepois et al., 2020). Researchers of the F.C. Barcelona examined the urine metabolome to monitor the internal training load and reduce injury incidence (Quintas et al., 2020). In this presentation, recent findings will be summarized, and novel perspectives opened.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Symposium

Thursday 10.02.2022

14:30 – 15:50

Room 1216 **The Athlete Biological Passport as a 'Data Pioneer' – What Lessons can be drawn for Sports Sciences?**

Chair: R. Faiss & F. Botrè

Confounding factors affecting the blood markers of the athlete biological passport
B. Krumm

Haematological biomarkers and plasma volume variations for the Athlete Biological Passport in active women taking oral contraceptive pills
B. Moreillon

Performance monitoring as a complementary tool for risk assessment in antidoping
J. Hopker J. Saugy

Legal and ethical challenges in the implementation of the ABP
M. Viret

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Confounding factors affecting the blood markers of the athlete biological passport

Authors:

Krumm B[1], Saugy J[1,2], Saugy M[2], Botrè F[1,2] and Faiss R[1,2]

[1]Institute of Sport Sciences, University of Lausanne, Lausanne, Switzerland.

[2]Center of Research and Expertise in Anti-Doping Sciences -REDs, University of Lausanne, Lausanne, Switzerland.

Abstract:

Introduction: Introduced in 2009, the Athlete Biological Passport (ABP)has become a valuable tool in the fight against doping through a longitudinal, adaptive, and individual monitoring of blood biomarkers. However, multiple intrinsic (genetic or individual characteristics) or extrinsic (training or environmental conditions) may induce hematological variations. A thorough knowledge of the latter confounders is essential to allow for the adequate interpretation of the athletes' blood longitudinal profiles by the ABP experts. This study investigated through a literature review(i) which hematological markers are the most robust, and (ii) the relative amplitude of the variations for the identified confounding factors.

Methods: A literature research was conducted on the PubMed and Google Scholar platforms. Studies including both of the two primary ABP biomarkers (i.e. [Hb] and Ret%) in addition to a clearly discriminated factor were included. In addition to doping practices, we have identified eight factors potentially affecting ABP blood markers: acute exercise, chronic training, exposure to a hot environment, exposure to a cold environment, exposure to a hypoxic environment, individual disorders or diseases, athlete characteristics and pre-analytical factors. The process resulted in the selection of 82 pertinent studies in an anti-doping context where added value for the interpretation of ABP profiles was identified.

Results: Within the 2325 studies initially identified, 82 studies were finally selected, involving a total of 10'190 subjects. Among the current variables of ABP, the percentage of reticulocytes was indentified as the most sensitive biomarker related to blood doping. However, probably partly because of the strong human homeostasis, absolute variations appear relatively limited. Furthermore, while doping practices represent a major confounding effect, the impacts of certain conditions (e.g. altitude or heat) are still debated. Discussion/Conclusion: The main observation is that the confounding effects widely vary in amplitude and duration depending on the type of effector. The ABP has demonstrated its effectiveness in detecting doping manipulations while the adaptive model may present some limitations and imperfection for the interpretation of blood variations in athletes subject to confounders. With this study, future developments of the ABP are proposed including large-scale measurements to establish hematological reference values in athletic populations from various origins. Reference values in women are also urgently needed. Finally, the limitation of the ABP in integrating intra-individual variations adequately may be overcome with the utilization of artificial intelligence to detect abnormal variations (or stability) patterns from the hundreds of thousands blood samples collected in athletes since the implementation of the ABP more than ten years ago.

SPORTWISSENSCHAFTLICHE
SOCIETE SUISSE DES
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SCIENCES DU SPORT

Title:

Haematological biomarkers and plasma volume variations for the Athlete Biological Passport in active women taking oral contraceptive pills.

Authors:

Moreillon Basile[1], Saugy J[1,2], Saugy M[2], Botrè F[1,2] and Faiss R[1,2]

[1]Institute of Sport Sciences, University of Lausanne, Lausanne, Switzerland.

[2]Center of Research and Expertise in Anti-Doping Sciences -REDs, University of Lausanne, Lausanne, Switzerland.

Abstract:

Introduction: The hematological module of the Athlete Biological Passport (ABP) monitors haematological variations that could be indicative of blood manipulation over time. This study investigated the potential influence of the oral contraceptive pill (OCP) on the ABP blood biomarkers, total hemoglobin mass (Hbmass) and plasma volume (PV) in 14 physically active women. A multi-parametric model inferring PV variations was also tested.

Methods: Blood and serum samples were collected each week for two consecutive OCP cycles (8 weeks), and the ABP haematological variables were determined according to the World Anti-Doping Agency guidelines. Additional 'volume-sensitive' biomarkers were computed in a multivariate analysis to determine individual estimations of PV variations. Actual PV variations were indirectly measured using a validated carbon monoxide rebreathing method.

Results: The ABP biomarkers, Hbmass, and PV remained stable over the two consecutive cycles. Significant differences occurred only between week 7 and week 1, with lower levels of haemoglobin concentration ([Hb]), haematocrit (HCT), and red blood cell count (RBC)and higher levels of PV at week 7.A significant reticulocytosis occurred 3 and 4 weeks after the bleeding. Some significant intra-individual PV variations were observed, in good agreement with the estimated PV changes. One subject was flagged for an atypical passport finding (ATPF) with a high [Hb] that could be corrected when accounting for the PV variation calculated by the model.

Discussion/Conclusion: We concluded that hematological biomarkers and PV variations are independent from the OCP cycle. Interestingly, another study investigated ABP biomarkers in active female without OCP (Mullen et al., 2020), but with no PV estimation or measurement. In contrast to that study, an approach including PV assessment allows for a better interpretation of hematological variation in plasma volume sensitive biomarkers as shown in our results. Since direct PV measurement is difficult to apply in anti-doping, a blood biomarker-based multi-parametric model greatly improves the sensitivity of the ABP.

References:

Mullen, Jenny, Baekken, Lasse, Bergström, Helena, Björkhem Bergman, Linda, Ericsson, Magnus, & Ekström, Lena. (2020). Fluctuations of hematological Athlete Biological Passport biomarkers in relation to the menstrual cycle. Drug Testing and Analysis. doi:10.1002/dta.2873

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Performance Monitoring as a complementary tool for risk assessment in antidoping.

Authors:

Hopker J[1] and Saugy J[2],[3], Griffin J[4], Hinoveanu L[1], Botrè F[2],[3] and Faiss R[2],[3]
[1]School of Sport and Exercise Sciences, University of Kent, UK.
[2]Institute of Sport Sciences, University of Lausanne, Lausanne, Switzerland.
[3]Center of Research and Expertise in Anti-Doping Sciences -REDs, University of Lausanne, Lausanne, Switzerland.4Statistical Science, University College London, UK.

Abstract:

Introduction: The athlete's biological passport (ABP) was developed in an attempt to limit athletes' use of performance enhancing substances. Since its introduction, the ABP has become a key tool for Anti-Doping Organizations (ADOs) to indirectly detect doping in blood, and more recently, urine. The key premise of the ABP is that doping methods such as blood transfusions, EPO injections, or endogenous anabolic androgenic steroid abuse, may influence biomarkers measured longitudinally as part of the ABP. However, there have been numerous studies that have demonstrated the impact of confounding factors on ABP. Therefore, there is a need to gather additional information on athletes to strengthen the ABP, and provide a forensic style intelligence led approach to anti-doping. One key piece of information that is available to anti-doping authorities that is currently seldom used for anti-doping purposes is the actual performance of the athlete. As the primary reason for doping is improvement of athletic performance, it is reasonable to suggest that monitoring an individual's competition results on a longitudinal basis may reveal suspicious performance improvements. It has been demonstrated that yearly world best performances increase with the emergence of new potent doping agents, such as anabolic steroids or EPO, and decrease as their effects become detectable. In addition, our previous work has identified rapid increase in an athlete's standardized performance as consistent with doping (Hopker et al., 2020). These findings raise the possibility of monitoring athlete performance in order to inform decisions on anti-doping testing. Thus, the main objective of such an "athlete performance module" used alongside the ABP would therefore to provide further information that could be used by ADOs in making informed decisions on passport cases.

Methods: This project analyses extensive athlete performance databases comprising i) the successive performance over time of >10000 athletes over the past decade ii) all the athletes for whom a sanction or ban due to an anti-doping rule violation has been enacted and iii) the longitudinal profiles of athletes in selected registered testing pools since the introduction of the ABP. Bayesian hierarchical modelling is used to assess the probability that an athlete's performance increases by more than a pre-specified threshold for a fixed amount of time which is used to develop a doping risk score. The effect of potential confounders on athletic performance (e.g., seasonality and environmental effects) and how they affect the model and its levels of sensitivity and specificity are also considered. We will illustrate how this model can be applied to track and field athletics, as well as its potential for use alongside the ABP for doping risk assessment.

Perspectives: The inclusion of longitudinal athlete performance data within the analysis and interpretation of the ABP and other laboratory results, has the potential to offer a wider risk prediction to identify athletes who are more likely to be involved in doping. As such, we will explore the impact of performance data retrospectively affecting decisions made upon ABP profiles by experts; the aim being to increase the effectiveness of decision making in anti-doping.

References:

Hopker, J., Griffin, J., Brookhouse, J., Peters, J., Schumacher, Y. O., & Iljukov, S. (2020). Performance profiling as an intelligence-led approach to antidoping in sports. Drug Test Anal, 12(3), 402-409. doi:10.1002/dta.2748

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:
Legal & ethical challenges of the Athlete Biological Passport

Authors:
Viret Marjolaine
Institute of Sports Sciences, University of Lausanne

Abstract:

Introduction: The Athlete Biological Passport ('ABP') used in the framework of the World Anti-Doping Code is a complex tool at the intersection of multiple disciplines, that can hence be looked at from different perspectives. Further, even one discipline may have to accommodate several conflicting perspectives that prove difficult to reconcile.

This paper focuses on two such conflicting perspectives within the legal and ethical field: the ABP as a means of evidence to enforce the ethical practice of sport, *versus* the ABP as a collection of large volumes of sensitive data gathered from individuals with little decisional autonomy. It will also analyze how current or future developments in the ABP may impact the delicate balance between these two perspectives.

Methods: documentary analysis of the regulatory framework governing the ABP; analysis of the handling of ABP findings in judicial proceedings; analysis of scientific literature on the ABP and future developments in the field

Discussion: From the functional perspective of anti-doping organizations, findings gained from the ABP represent items of 'evidence' for legal purposes, which can be used to investigate athletes and bring disciplinary proceedings against them. This function supports the, purported, ethical benefit of improving fairness in sport and/or protecting the athlete's health. Key parameters for how well this function can be performed are validity and reliability of the findings, which must be combined, in law, with procedural efficiency and simplicity of use.

In order to adequately fulfill its function, however, the ABP relies on biological data, both for the research needed to refine relevant parameters or reference populations, and for the monitoring of individual athlete profiles as part of doping control. The ABP can thus also be viewed as the product of an elaborate enterprise of systematic data processing. Under the angles of privacy and research ethics, data processing is governed by the principle of minimization, heightened protection standards for sensitive biological data, as well as respect for the subjects' autonomy and self-determination. Applied in a context in which consent is frequently neither informed nor free, these principles run contrary to the ambitions of anti-doping organizations to continuously improve the capacities of the ABP for detecting suspicious patterns. Developments such as added profiling based on performance data, or machine learning applied to 'big data', will only compound these legal and ethical challenges.

One way of reconciling the two opposite perspectives is to make progress on the functionality of the ABP conditional on improved fairness for the athletes, as individuals who are producing the data necessary for operating a tool that can be used to subject them to severe penalties. Further processing of data can be legally and ethically justifiable if it is strictly necessary to secure better protection of the affected individuals' rights. This means that research efforts to enhance the ABP need to incorporate, as a core consideration in their design and implementation, the aim of increasing the ability to discriminate between doping-relevant and other findings.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

YIA

Thursday 10.02.2022

09:15 – 10:55

Main room **Young Investigator Award**
Chair: R. Antonini Philippe

Short-term balance consolidation relies on the integrity of the primary motor cortex (M1): a rTMS study
S. Egger

Patterns of leisure-time physical activity in youth as predictors for lifelong activity? A latent profile analysis with retrospective life course data
L. Lenze

Creativity in elite youth football: Enhancing players' motor skills rather than a divergent thinking ability fosters creative actions
S. Zahno

Bodily commitment in physical education increases adherence to salient educative norms
T. Schweizer

Actor engagement within digital sport brand communities –A case study on social practices on digital engagement platforms
P. Stegmann

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Short-term balance consolidation relies on the integrity of the primary motor cortex (M1): a rTMS study

Authors:

Egger S.[1], Wälchli M.[1], Rüeger E.[1], Taube W.[1]

[1] Department of Neurosciences and Movement Science, University of Fribourg, Fribourg, Switzerland

Abstract:

Introduction: The human brain is capable of learning numerous new motor tasks through practice. A crucial role in the learning process of motor tasks is attributed to the plasticity of the primary motor cortex (M1) (Karni et al., 1995; Sanes & Donoghue, 2000). However, M1 is assumed to be differently involved depending on the motor task and the motor learning paradigm. For instance, for a long time, balance control and balance learning were considered to rely mainly on spinal reflex circuits (Dietz, Horstmann, & Berger, 1988; Keck et al., 1998) and subcortical structures (Lalonde & Strazielle, 2007; Visser & Bloem, 2005). More recently, knowledge emerged that higher cortical centers – and especially M1 – also adapt in response to balance learning (Jacobs & Horak, 2007; Taube, Gruber, & Gollhofer, 2008). Furthermore, several studies indicated functional and structural adaptations in M1 after a few balance learning sessions (Taubert et al., 2010; Taubert, Lohmann, Margulies, Villringer, & Ragert, 2011; Taubert, Mehnert, Pleger, & Villringer, 2016). However, despite the high interest in balance control in general and the role of M1 in particular, the role of M1 in consolidating balance tasks is still not clear. The reason for this is that causal studies are missing and that it is a distinct possibility that adaptations in M1 might be a consequence of improved balance (e.g. less postural sway) rather than the actual driving force for improved balance coordination. One technique to investigate the impact of M1 in learning processes more directly is to impair the consolidation with the application of repetitive TMS (rTMS). For the current study, we hypothesized that if M1 is (at least partly) responsible for the adaptations in balance control, application of rTMS should impair consolidation of balance tasks. In contrast, if the reported changes in M1 are only the consequence of improved balance control (e.g. less postural sway) but are not the driving force, disruption of M1 should not impair consolidation of balance tasks. For this purpose, two different groups were tested, one receiving rTMS and the other sham rTMS over M1 after having performed a balance learning.

Methods: Thirty young and healthy participants were randomly allocated into the rTMS or sham-rTMS group without knowing their group affiliation. The experimental design included an acquisition phase, followed by either 15 minutes of rTMS or sham-rTMS, and finally a retention phase 24 hours later. For the acquisition phase, participants completed 6 series (S1 to S6) with 8 trials per series on a custom-made rocker-board balance device after a brief familiarization (6 trials). Participants stood shoulder width on the platform of the rocker-board and aimed to keep the platform as still and horizontal as possible. After completion of the balance acquisition participants received either rTMS (1 Hz at 115 % of resting motor threshold (rMT)) or sham-rTMS (1 Hz stimulations with the coil rotated orthogonally to the scalp) during 15 minutes (i.e. 900 stimulations). The following day (24 hours later), participants performed a retention test (Ret), which included a short re-familiarization (6 trials) and 1 series of 8 trials on the rocker-board. RTMS was delivered to M1, more precisely at the hot-spot for the soleus muscle, which was one of the prime movers during balance acquisition. The rMT was defined in a seated position as the intensity that triggered motor evoked potential peak-to-peak amplitudes greater than 50 µV in at least 5 out of 10 trials.

Results: The two investigated balance parameters (i.e. 'mean deviation' and 'time in +/- 4 degrees') indicate that the postural performance on the rocker-board significantly improved during the acquisition phase from S1 to S6 ('mean deviation': $F_{1,27} = 81.613$, $p < .001$, $n2p = 0.751$; 'time in +/- 4 degrees': $F_{1,27} = 67.099$, $p < .001$, $n2p = 0.713$) independent of the intervention group (rTMS vs. sham-rTMS 'mean deviation': $F_{1,27} = 0.059$, $p = 0.810$, $n2p = 0.002$; 'time in +/- 4 degrees': $F_{1,27} = 0.147$, $p = 0.704$, $n2p = 0.005$). However, the TIME*GROUP interaction of the ANCOVA with

BASELINE as covariate revealed differences in consolidation (i.e. from S6 to Ret) between the rTMS and sham-rTMS group ('mean deviation': F1,26 = 10.537, p = 0.003, n2p = 0.288; 'time in +/- 4 degrees: F1,26 = 10.022, p = 0.004, n2p = 0.278). Bonferroni-corrected paired student ttests revealed a significant improvement for both parameters from S6 to Ret for the sham-rTMS group ('mean deviation': t13 = 2.634, p = 0.042, d = 0.704; 'time in +/- 4 degrees': t13 = -2.714, p = 0.036, d = -0.725) and a non-significant decrease for the rTMS group ('mean deviation': t14 = 1.947, p = 0.144, d = -0.503;'time in +/- 4 degrees': t14 = 1.633, p = 0.250, d = 0.422).

Discussion/Conclusion: The present results demonstrate for the first time a causal relationship between the involvement of M1 and the early learning and consolidation of a balance task. This can be concluded as the rTMS group demonstrated a significantly worse consolidation (i.e. loss of performance from the end of the acquisition phase to the start of the retention phase) of the balance task in contrast to the sham-rTMS group (which showed a significant increase in performance). Thus, the present results confirm previous findings that higher cortical centers (especially M1) adapt in response to balance learning (Jacobs & Horak, 2007; Taube et al., 2008). However, previous studies could not clarify whether these adaptations in M1 might be a consequence of less postural sway rather than be the driving force for balance skill enhancements (Taubert et al., 2010; Taubert et al., 2011; Taubert et al., 2016). With the present design, i.e. rTMS applied after the acquisition, it was possible to influence the integrity of M1 in an isolated manner. While both groups had similar performance at the end of the acquisition phase, the sham-rTMS group consolidated the task significantly better than the rTMS group. Indeed, the present study therefore confirms that the integrity of M1 has to be intact in the early balance learning and consolidation phase. The underlying mechanism of how rTMS interferes with consolidation of a motor task is still unclear. However, the applied rTMS protocol (900 pulses at 1 Hz) seems to induce a kind of long-term depression (Chen et al., 1997), which probably impairs synaptic efficacy in M1 and thus, interferes with the consolidation of the balance task.

References:

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SPORTWISSENSCHAFTLICHE
SOCIETE SUISSE DES
GESELLSCHAFT DER SCHWEIZ
SCIENCES DU SPORT

Title:

Patterns of leisure-time physical activity in youth as predictors for lifelong activity? A latent profile analysis with retrospective life course data

Authors:

Lenze L[1,2], Klostermann C[1], Schmid J[2], Nagel S[2]

[1]School of Education FHNW, Switzerland

[2]Institute of Sport Science, University of Bern, Switzerland

Abstract:

Introduction: In view of the known benefits of leisure-time physical activity (LTPA) at the individual (e.g., health) and societal levels (e.g., reduction in health care costs due to physical inactivity), it is desirable to promote regular and, if possible, long-lasting LTPA. For this purpose, earl y socialization in LTPA is postulated to play a decisive role for lifelong LTPA (Kjønniksen, Anderssen, & Wold, 2009). Moreover, it is known from life course research that early experiences influence later ones (Bernardi, Huinink, & Setters ten, 2019). However, the stability ("tracking") of LTPA over the life course is low (Telama, 2009). Thus, a deeper examination is needed that not only takes stability in to account, but also considers specific predictors of LTPA in youth for lifelong LTPA. Such predictors in youth were identified in a narrative review presented at the SGS in 2019 (Lenze, Klostermann, Lamprecht, & Nagel, 2019): early entry into LTPA, continuous participation in LTPA, frequency of LTPA, number of different activities (the more the better), organized LTPA or club sports, unorganized LTPA, competitive sports, and good sport-motor skills. Nevertheless, three research gaps remain: 1) existing research covers only a s mall part of possible predictors per study; 2) the measurement of lifelong LTPA was mostly recorded at one time point in (young) adulthood; 3) investigating isolated predictors might be misleading, as there are interacting factors of LTPA within an individual and thus different patterns of LTPA occur in youth (e.g., Gut, Schmid, & Conzelmann, 2020) which may lead to lifelong LTPA (e.g., certain single predictors might compensate for other predictors, such that lifelong LTPA could be enabled by various forms of LTPA in youth).The present study is based on the life course approach with its general assumption of dependencies over the time in the life course (Bernardi et al ., 2019). Telama (2009) specified this assumption for LTPA by formulating hypotheses describing different forms of LTPA in earlier years that may lead to lifelong activity. Based on these theoretical considerations and the known empirical predictors, we build patterns with four predictors for LTPA in youth and compare them with an index of lifelong LTPA in adulthood to check (1) which patterns of LTPA in youth emerge and (2) to what extent they are particularly promising for lifelong LTPA.

Methods: This study is part of a SNSF-funded project in collaboration with the federal survey «Sport Schweiz». A retrospective telephone survey with the CATI-method of n= 1519 Swiss inhabitants aged between 25 and 76 years (59.2 ± 11.75) was conducted in 2019. The questionnaire used is a further development of previous studies investigating LTPA during the life course (e.g., Klostermann & Nagel, 2014) and wastes ted qualitatively and quantitatively in multiple waves, including a separate reliability check with the test-retes t-method (n= 29).The patterns indicators used relate to LTPA and were recorded up to the age of 20: 1) Number of regularly active years (actY; 0-18); 2) Number of different activities practiced (NumA; 0-5); 3) whether s el f-organized activities were practiced(s-org A; 0, 1); 4) whether organized activities were practiced (orgA; 0, 1). These four indicators showed good values in the reliability test (Krippendorff's $\alpha > .80$). Other possible indicators shown in the literature were not integrated due to content overlap, multicollinearity, or unreliable data quality (frequency of LTPA per week). The reliably recorded index of lifelong LTPA was calculated from 21 years until the current age of each person (ratio of regularly active years divided by the years of life; 0-1). Latent profile analyses were calculated, and statistical and content-related criteria were used to determine the optimal profile solution (Masyn, 2013). Multi-nomial regression analyses were then conducted to compare profiles with the index of lifelong LTPA.

Results: Current results show six different profiles of LTPA in youth (descriptive values of means and probabilities of each indicator in brackets):

1) mostly inactive youth (act Y = 0.05; NumA = 0.32; s-orgA = 3%; orgA<1%);

2) very diversely active early starters (actY = 13.53; NumA = 4.41; s-orgA = 78%; orgA = 89%);
3) very diversely active late entrants (actY = 5.29; NumA = 4.19; s-orgA = 74%; orgA = 78%);
4) low diversely active, self-organized early starters (actY = 13.62; NumA = 1.92; s-orgA > 99%; orgA = 38%);
5) low diversely active late entrants (actY = 3.46; NumA = 1.94; s-orgA = 62%; orgA = 51%);
6) low diversely active, organized early starters (actY = 11.54; NumA = 1.93; s-orgA < 1%; orgA > 99%).

Regarding the relationship with the index of lifelong LTPA in adulthood, the following significant differences between profiles are present: the most active people in adulthood are people from profile 4 (index = 0.96± 0.01) and profile 2(index = 0.95± 0.01). They are significantly more active than people from profile 1 (p< .001), profile 5(p= .001 for profile 4; p= .003 for profile 2), and profile 6 (p= .004 for profile 4; p= .01 for profile 2). Al so mostly active in adulthood are people from profile 3 (index = 0.93± 0.02), profile 6 (index = 0.91± 0.02), and profile 5 (index = 0.88± 0.02) which are all more active than people from profile 1 (p< .001). People from profile 1 have the lowest activity in adulthood (index = 0.59 ± 0.02).

Discussion/Conclusion: The present study shows qualitatively different patterns of LTPA in youth and their relations to lifelong LTPA in adulthood. Comparable profiles already emerged in similar studies (e.g., Gut et al., 2020). It seems that there are different ways to achieve a high level of lifelong LTPA such as having high values of all indicators (profile 2), or high levels of at least two indicators (profile 3, 4, & 6). If the number of active years and different activities is rather low in youth, it is more difficult to achieve that many active years in adulthood (profile 5). And mostly inactive people in youth are cl early the least actives over the adulthood (profile 1). In sum, it appears that these predictors can be compensated by each other. In a variable-oriented analysis, multiple regression analyses show significant effects of each predictor which could lead to the misleading interpretation to promote all these aspects of LTPA in youth. One of the limitations of this study is the high level of LTPA, especially with regard to the index of lifelong LTPA. Currently, the stability of the reported results is s till being tested by considering age, among other factors. Additionally, a differentiated measure for the current LTPA at the time of the survey as a further criterion is being added. Nevertheless, these results already suggest that different patterns of LTPA in youth can lead to lifelong LTPA. Thus, the findings of this study prove beneficial for the promotion of LTPA in youth and consequently also over the entire life course.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Creativity in elite youth football: Enhancing players' motor skills rather than a divergent thinking ability fosters creative actions

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Abstract:

Introduction

Players that are capable of performing creative actions are highly valued in team sports, especially in invasion games like football. In these sports, developing creative players is widely discussed as a crucial – as well as challenging – goal (e.g., Cross, 2013). In empirical studies on the topic so far, creativity has predominantly been understood as a player's divergent thinking (DT) ability (Memmert, 2015). DT is the cognitive ability to generate multiple ideas in response to a given problem (Guilford, 1967) and is widely used as a measure in general creativity tests (Reiter-Palmon, Forthmann & Barbot, 2019). In sport-specific studies, DT is assessed by the number, variety and originality of ideas a player is able to generate in response to game situations (cf. Memmert, Hüttermann & Orliczek, 2013). Based on a substantial body of research indicating that DT can be improved with training, methodological principles to foster creativity in team sports by enhancing DT have been suggested (e.g., Memmert, 2015). However, the fundamental assumption that enhanced DT transfers to creative on-field actions has yet to be examined (Zahno & Hossner, 2020). Challenging this assumption, we hypothesize that players' potential to perform creative actions is foremost rooted in their motor-skill repertoires rather than in DT. Instead of attributing creativity to a distinct cognitive ability, we argue that when a highly skilled player is less constrained by his/her own motor skills, the probability of displaying actions that go beyond current expectations – and are thus perceived as creative –, will increase naturally. In the present study, a decisive experiment was designed in order to put predictions deduced from both explanations to test.

Methods: In a field-based experiment, 16 elite youth footballers (M_{age} = 12.90 ± 0.27 years) were randomly assigned to a training intervention specifically designed to enhance either their football-specific DT (DT group) or their motor skills (functional skills; FS group). Six 20 min sessions were fully integrated in their regular club training over four weeks. Before and after the intervention, we assessed (1) players' football-specific DT using a video-based task – following procedures of previous creativity studies in sports (Memmert et al., 2013) – as well as (2) the functionality and creativity of actions performed in a representative game situation using expert ratings – following procedures of the consensual assessment technique (Hennessey, Amabile & Mueller, 2011). Accordingly, players' actions were videotaped, reassembled in a random order and rated by five independent football experts with longstanding coaching (M = 22.20 ± 11.05 years) and playing (M = 27.20 ± 7.63 years) experience. For all dependent variables (DT-score, functionality- and creativity-rating of on-field actions), a group (DT vs. FS) x time of measurement (pre vs. post) ANOVA with repeated measures on the second factor and planned t-tests were conducted.

Results: As expected, in DT, the DT group improved more than the FS group from pre- to posttest, $F(1,14) = 13.47$, $p < .01$, $\eta_p^2 = .49$. Consequently, after the training intervention, DT test-scores were superior in the DT group (M = 0.81, SD = 0.46) compared with those of the FS group (M = -0.13, SD = 0.52), $t(14) = 3.84$, $p < .01$, $d = 1.92$.

On the field, however, improvements in DT did *not* manifest in more creative actions. Rather, the FS group showed more pronounced on-field improvements than the DT group, as displayed by higher ratings not only in the functionality, $F(1, 14) = 8.61$, $p = .01$, $\eta_p^2 = .38$, but also in the creativity of actions, $F(1, 14) = 5.87$, $p = .03$, $\eta_p^2 = .30$.

Discussion/Conclusion: On the one hand, the current results are consistent with previous findings underlining the trainability of DT in team sports (Memmert, 2015). On the other hand, however, the missing transfer of DT improvements to creative actions in game situations severely challenges the so far predominant framework used to address creativity in team sports. More specifically, the

obtained pattern of results suggests that the validity of DT as an outcome measure to substantiate methodological principles for creativity trainings (e.g., Memmert, 2015) as well as the recommendation to apply DT tests as a talent assessment tool (e.g., Roca et al., 2021) should be critically considered.

For sports practice, the present findings suggest that performing creative actions on the field is better fostered by enhancing players' motor skills and thus expanding their own action repertoire than by seeking to improve DT.

As a matter of course, the results obtained in this experiment need to be confirmed in further studies to claim generalizability, preferably with larger samples of even more experienced players and with different on-field game situations. In this regard, as part of a series of four studies, two follow-up experiments with male under-12 (N = 33) and female under-19 elite youth football players (N = 16; 13 Swiss national team) were recently conducted. Preliminary data analyses reveal confirming results, i.e., no correlations between on-field creativity and DT as well as moderate to large correlations between on-field creativity and players' motor-skill repertoire. The complete result pattern of these follow-up studies will be presented at the conference.

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SPORTWISSENSCHAFTLICHE
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SCIENCES DU SPORT

Title:

Bodily Commitment in Physical Education Increases Adherence to Salient Educative Norms

Authors:

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Abstract:

Introduction:

For more than 100 years, educational virtues, such as the transmission of values, have been attributed to Sports and Physical Activities (SPAs). While SPAs are at the core of Physical education guidelines around the world (e.g.; UNESCO, 2015), their supposed capacity to build values, rather than that of other medium of socialization, is often debated and still not well understood. We propose that this ability comes from the particular emotional context of SPAs. Indeed, the fundamental logic of SPAs is to engage practitioners in bodily challenges to themselves, to others or to the environment. Practitioners are thus placed into intense and specific emotional climate of symbolic and physical threat (Rull & Margas, 2019). We suggest that this bodily commitment, specific to the practice of SPAs, enhances the socialization process of norm adherence, by facilitating modification of personal values. In line with models of social regulation in front of threats (e.g., Terror Management Theory, Greenberg et al., 1986; Security system, Hart et al., 2005), various threatening climates can enhance adherence to salient social norms (e.g., Gaillot et al., 2008). Our two experimental studies aim to demonstrate that bodily commitment in SPAs is associated with enhanced norm adherence, which includes modification of personal values, attitudes and intentions of behaviors. Our studies tested this issue regarding pro-environmental (Study 1) and healthy eating (Study 2) educative norms.

Methods: Participants were students from three different obligatory schools in Switzerland. An a priori sample size (G*Power 3.1.9.6 version) was conducted for both studies using the same protocol; an ANOVA within-between and a simple ANOVA for .80 power (Cohen, 1992). To consolidate the cover story and avoid bias, we did, however, involve all classes of each school. Authorizations from the ethic committee of the University of Lausanne, from the educational research coordination committee of the canton of Vaud and the office of obligatory education of the canton of Neuchâtel were obtained before the experiments. After collecting headmasters, teachers, parents and participants consent forms, 139 pupils (M_{age} = 14.04; 58.5% girls) finally took part to study 1 and 187 (M_{age} = 13.59; 61.5% girls) to study 2.

Participants initially answered a value questionnaire measuring three different values including a pro-environmental (Study 1) or a healthy eating one (Study 2), consisting of a diagnostic measure of personal values and offering a cover story to manipulate the salience of the experimental norms. In the second study, healthy eating attitudes were additionally measured. Two weeks later, students were randomly assigned to a 2 (norm salience) x 2 (bodily commitment) factorial design.

We first made either the experimental norm or the control norm (anti-discrimination) salient, by presenting graphic figures (Study 1) or pictures (Study 2) representing manipulated percentages of responses of school pupils to the initial measures. Pupils then randomly performed a task with a strong or no bodily commitment (Study 1), or with a strong or weak bodily commitment (Study 2). The chosen SPAs consisted of a climbing (Study 1) and a gymnastic task (Study 2). Participants finally completed a questionnaire measuring the same values as in pre-measures, perceived emotional states during the task and pro-environmental intentions of behavior (Study 1) or healthy eating attitudes (Study 2). Healthy eating behaviors were also measured a week later in study 2. All participants were personally debriefed afterwards.

Results: We conducted normality tests and confirmed our measurement scales for both studies. The independent variables were also confirmed, as the strong bodily commitment condition effectively induced more perception of threat in study 1, F (1, 135)= 47.93; p = .000; η^2_p = 0.26; CI 95% = [-2.28, -1.27], and in study 2, F (1, 185)= 79.26; p = .000; η^2_p = 0.30; CI 95% = [-2.16, -

1.38]. Concerning study 1, the repeated measures ANOVA on pro-environmental values revealed a significant time*salience*bodily commitment interaction, F (1, 135)= 4.63; p = .033; η_p^2 = 0.03, which confirmed our hypothesis: When the pro-environmental norm is salient, strong bodily commitment increases adherence to this norm. We replicated these results in study 2, as the repeated measures ANOVA on healthy eating values revealed a significant time*salience*bodily commitment interaction, F (1, 183)= 5.23; p = .023; η_p^2 = 0.03. When the healthy eating norm is salient, strong bodily commitment increases adherence to this norm Additionally, the repeated measures ANOVA on healthy eating attitudes also revealed a significant time*salience*bodily commitment interaction, F (1, 183)= 4.04; p = .046; η_p^2 = 0.02. Participants have enhanced healthy eating attitudes in condition of strong bodily commitment, when the healthy eating norm is salient. Contrary to our expectations, significant effects were not found on pro-environmental behavioral intentions (p > .088) nor on healthy eating behaviors (p > .358).

Discussion: These studies are the first to identify that strong bodily commitment in SPAs improves adherence to salient norms. Our second study strongly confirmed this hypothesis as it replicated the results of study 1 with another educative norm (healthy eating), a new control group (weak bodily commitment) and with new results on attitudes. We thus improved our experimental conditions in many ways. These results open up on new processes, linking emotional climate to norm adherence, that are to our knowledge, not explored yet both in sport sciences and educational sciences.

Moreover, these studies were conducted in ecological condition, close to the reality of the educative field. It thus directly serve both the scientific but also the applied domains. These new processes indeed help to understand why SPAs have a particular role in socialization and restore the importance of physical education (PE) within education systems. They also offer possible innovations in front of educational issues based on manipulation of the emotional climate. From an educational perspective, it encourages to keep the heart of SPAs, which is the bodily commitment, and to pay attention to the emotional intensity of PE contents.

To sum, these results offer new explanations about the promotion of SPAs in educational guidelines. It also refocuses us on the importance of physical and emotional dimension of SPAs, at a time where the use of digital technology for pedagogical purposes is more and more emphasized. Finally, further studies are needed to better understand these processes and highlight the moderators of these effects, notably, in order to give concrete levers to educators.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Actor engagement within digital sport brand communities –A case study on social practices on digital engagement platforms

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Abstract:

Introduction: Stakeholders (e.g., fans, sponsors) in professional team sport settings frequently engage in non-transactional behavior toward the sport club, for example when fans chant for their team or sponsors network with each other in the VIP hospitality (Buser, Woratschek, & Schönberner, 2020). Such forms of behavior are described as (actor)engagement and can be defined as volunteer behavior to integrate resources beyond (or without) contractual agreements (Alexander, Jaakkola, & Hollebeek2018; Buser et al., 2020). Engagemental ways occurs in social contexts (e.g., engagement platforms [EP]; Alexander et al., 2018) and is guided by institutions. These institutions define norms and rules within a brand community (Koskela-Huotari & Vargo, 2016). Thereby, institutions and individual actors' engagement behaviors are interrelated and thus, institutions enable or constrain actors' engagement behaviour within the context of an EP. This implies that actors experience in routinized actions, which has been conceptualized in social practice theory (Schau, Muñiz, & Arnould, 2009), in which the main unit of analysis are practices – linked ways of understanding and doing things. This indicates that a practice not only represents behaviour but also represents the shared meaning of a behavioral act within a specific context. Therefore, collective identities and shared assumptions about engaging in actions in specific brand communities are formed by the nature of practices (Schau et al., 2009).Previous research in sport marketing either focused on dyadic engagement practices(e.g., Uhrich, 2014) or on non-digital EPs (Grohs, Wieser, & Pristach, 2020).Therefore, the present study intends to investigate which engagement practices can be observed on digital EPs using a network-oriented approach.

Methods: Four digital EPs from two sport club brands were analyzed within a multi-case study design applying a mixed-method approach consisting of netnography, document analysis and semi-structured interviews. By sampling empirical data from various EPs, we intended to change the unit of analysis from focusing on individual actors' engagement practices and specific brand communities towards common engagement practices within brand communities on digital Eps (Schau et al., 2009). We examined two social media Eps (Facebook and Instagram) of BSC YBand two club-owned smartphone app EPs (a fan and a business app) of SCB. Both clubs are highly innovative regarding digital marketing activities, and therefore offer ideal research contexts. Qualitative content analysis was applied to analyze the data. In so doing, we identified a variety of actor groups, for example fans, sponsors, coaching staff, players and politics. Additionally, we entailed a deductive analysis of the empirical data based on Schau et al. (2009). We analysed the data using the practice categories social networking (SN), impression management (IM), community engagement (CE) and brand use (BU). After coding the data in categories, we revisited data on the level of practices and coded it accordingly to twelve practices within the four categories. Lastly, we inductively identified practices and practice categories that had not been described previously. Finally, to determine intercoder-reliability, we applied the method according to Perreault and Leigh (1989), which indicates for a good match (r= 0.84).

Results: The results reveal a variety of engagement practices among the four investigated digital EPs. Actors engage in the practice of connecting (from the newly derived practice category linking, L), when for example BSC YB connects its fans with the Swiss Football League's poll on the Goal of the Year to vote for one of its players or when SCB offers their sponsors a chat function on the business app to connect with each other. The practice requesting (CE) has also been identified, which describes the call of an actor (e.g., the sport club) for engagement of other actors. BSC YB and SCB both asked their fans respectively sponsors to share pictures from the Championship

trophy or to share the best experience they had with the club in the past season using the digital EPs. Sharing experiences evolves into the practice of documenting (CE) that refers to the description of the relationship journey within the brand community network. SCB uses the fan app EP to request (CE) fans, sponsors and other actors to state their mood and satisfaction with the club, which offers as a simple feedback mechanism. Lastly, we observed intensifying (IM), a valenced practice to stimulate emotions that only occur on social media EPs when BSC YB tried to prepare their fans for an upcoming game or customizing (BU), when SCB used their smartphone to personalize offerings towards specific fan groups.

Discussion/Conclusion: The present study contributes to practice theory and engagement literature in sport marketing since it extends previous findings by considering digital EPs of brand communities while focusing on networks of actors. First, we found linking as a central form of practices in sport clubs' digital brand communities, which occurs in connecting actors from the network with each other in various forms. Digital Eps immensely facilitate and enable linking practices (Stegmann, Nagel, & Ströbel, 2021). Since previous studies did not focus on a network-oriented approach when studying digital EPs, it seems reasonable that linking practices were not identified so far. Second, in comparison with other studies (Grohs et al., 2020) in sport brand communities, we identified additional actor engagement practices on digital EPs such as informing & sharing (IM), appreciating (CE) and organizing (BU) that majorly occur due to linking practices. Lastly, in comparison with Schau et al. (2009), we did not identify milestoning (CE) nor badging (CE) practices. This seems reasonable since milestones and their translation into symbols (e.g., buying merchandise) are more likely to occur at the sport venue and not in the digital space. Comparing the four digital EPs, it becomes evident that engagement practices vary. Considering the social media EPs, our study reveals that brand use practices only rarely occur. It can be expected that fostering brand use is not a major aim of social media EPs. However, it seems that social media Eps are more likely used to enable network-oriented community engagement or to linking actors within a larger network. In contrast, actors on the fan app EP mainly engage in the practice categories of impression management and brand use. From the lack of practices from the category of social networking, it becomes apparent that the fan app is hardly used to enhance social bonds among the network of actors. Lastly, we identified that the business app enables practices from various categories (e.g., social networking, brand use). Thus, we can assume that the business app combines practices from social media and fan app Eps exclusively for sponsors.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Oral Session

Wednesday 09.02.2022

10:15 – 11:45

Room 2212 **Machine Learning & Sports Injuries**

Chair: V. Gremeaux

Using machine learning to enhance sacral acceleration-based estimations of running stride temporal variables and peak vertical ground reaction force
A. Patoz

DeepACSA - Automating human lower limb muscle ultrasound image analysis using deep learning
P. Ritsche

Training interventions to prevent sport-related concussions – A systematic review.
S. Zimmermann

Development and evaluation of a web application for recovery management in junior ice hockey players
S. Ketelhut

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Title:

Using machine learning to enhance sacral acceleration-based estimations of running stride temporal variables and peak vertical ground reaction force

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Abstract:

Introduction: Contact time ($t_c$tc), flight time ($t_f$tf), duty factor (DF; the ratio of $t_c$tc over stride time), and peak vertical ground reaction force ($F_{z,max}$Fz, max) are key variables of running biomechanics due to their relation to performance and running-related injuries. The gold standard method to measure these variables is a force plate. However, a force plate is not always at hand and not very portative overground. In such situation, a method based on an easy to use and very cheap inertial measurement unit (IMU) might be preferred. In fact, if $t_c$tc, $t_f$tf, DF, and $F_{z,max}$Fz, max can be accurately estimated, these estimations would allow coaches and clinicians to longitudinally monitor performance and injury-related factors without an expensive force-measuring equipment. Previously, these variables were estimated based on data recorded using a single sacral-mounted IMU and led to root mean square errors (RMSEs) of 20ms for $t_c$tc and $t_f$tf and 0.15BW for $F_{z,max}$Fz, max [1, 2]. To decrease these errors, machine learning (ML) could further be applied to these estimations, and this constituted the purpose of this study.

Methods: One hundred runners (73 males and 27 females) ran at 9, 11, and 13km/h on an instrumented treadmill while wearing a sacral-mounted IMU. Force and IMU data were recorded at 200 and 208Hz, respectively, and used to obtain gold standard and estimated values for $t_c$tc, $t_f$tf, DF, and $F_{z,max}$Fz, max. Then, three ML models [linear regression (LR), support vector regression (SVR), and two layers neural network (NN2)] were trained for each of the four estimated variables using their corresponding IMU-based estimations from 80 participants combined with running speed, stride frequency, and body mass, and using a 5-fold cross validation approach. Predicted values for the remaining 20 participants were compared to gold standard values. The prediction accuracy was quantified by calculating the mean absolute percentage error (MAPE) and RMSE.

Results: The ML models predicted $t_c$tc with an MAPE of 3.6±0.1% and RMSE of 12.2±0.2ms, which led to a 36.7±1.3% decrease in RMSE compared to the IMU-based estimation of $t_c$tc. As for $t_f$tf, the MAPE and RMSE were 9.3±0.4% and 11.7±0.4ms, which resulted in a 37.6±2.1% decrease in RMSE compared to the IMU-based estimation of $t_f$tf. DF was predicted with an MAPE of 3.6±0.2% and RMSE of 1.7±0.1%, leading to a decrease in RMSE of 33.6±4.5% compared to the IMU-based estimation of DF. Finally, the ML models predicted $F_{z,max}$Fz, max with an MAPE and RMSE of 3.8±0.06%, and 0.13±0.01BW, corresponding to a 9.8% decrease in RMSE compared to the IMU-based estimation of $F_{z,max}$Fz, max. The MAPEs of the predicted variables were significantly smaller than the ones of the estimated variables (P≤0.001), except for $F_{z,max}$Fz, max (P≥0.15). However, there were no significant differences among the MAPEs given by the three ML models for the four variables (P≥0.13).

Discussion/Conclusion: Further applying ML to IMU-based estimations of $t_c$tc, $t_f$tf, DF, and $F_{z,max}$Fz, max led to predictions with higher accuracy, even if the enhancement may not be clinically relevant for $F_{z,max}$Fz, max. The simplest ML model (LR) was similarly able to improve the prediction accuracy than more complicated models such as SVR and NN2. Therefore, the LR model should be used to improve the accuracy of the estimations of $t_c$tc, $t_f$tf, and DF obtained using a sacral-mounted IMU across a range of running speeds.

References:

Patoz, A., Lussiana, T., Breine, B., Gindre, C. & Malatesta, D. (2021). Estimating effective contact and flight times using a sacral-mounted inertial measurement unit. *Journal of Biomechanics,* 127, 110667. doi:10.1016/j.jbiomech.2021.110667

Patoz, A., Lussiana, T., Breine, B., Gindre, C. & Malatesta, D. (2021). A single sacral-mounted inertial measurement unit to estimate contact time, flight time, and peak vertical ground reaction force in running. *Submitted to Sensors*

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

DeepACSA - Automating human lower limb muscle ultrasound image analysis using deep learning

Authors:

Ritsche P[1], Wirth P[2], Cronin N J[3], Roth R[1], Keller M[1], Sarto F[4], Narici M V[4], Faude O[1] & Franchi M V[4]

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Abstract:

Introduction: Ultrasound is widely used to study the relationship between muscle morphology, quality and performance and their changes due to disuse, ageing or training. A key feature of quadriceps muscle morphology is the anatomical cross-sectional area (ACSA) since the (changes in) size of this muscle impact on force generation capacity and locomotor performance (Trezise, Collier, and Blazevich 2016). We investigated the relationship of knee extensor isometric muscle torque and m. rectus femoris (RF) and m. vastus lateralis (VL) ACSA in 44 high level youth soccer players (age = 16.5 years (14 to 19)). The results of these (yet) unpublished data showed that the isometric knee extension muscle torque of the right leg is positively correlated to the ACSA of the right RF ($r = 0.54$ (95% CI 0.27, 0.73), $p < 0.001$) and the right VL ($r = 0.56$ (0.29, 0.74), $p<0.001$). We analyzed the acquired ACSA extended-field-of-view (EFOV) ultrasound scans according to common procedures using manual evaluation. Manual analysis however is complex, subjective, and laborious. Thus, an approach to accelerate the ACSA segmentation process and reduce the subjectivity of manual segmentation is needed. We recently presented a semi-automated algorithm (ACSAuto) using image processing filters for RF and VL muscle localization in EFOV ultrasound images (Ritsche et al. 2021). Although muscle segmentation using ACSAuto was comparably accurate to manual analysis and accelerated the evaluation process, the user must still validate or correct the suggested ACSA. Furthermore, image processing filters of ACSAuto are highly dependent on image properties. To overcome these difficulties of ACSAuto, the use of deep learning could be advantageous. Although first studies successfully used deep neural networks in ultrasound image analysis, none of these approaches allows to analyze the EFOV ACSA of lower limb muscles and described a way to implement their code (Chen et al. 2019; Marzola et al. 2021). The aim of this project was therefore to develop and evaluate DeepACSA, a deep learning approach to automatically segment the ACSA in EFOV ultrasound images of the RF, VL and mm. gastrocnemius medialis (GM) and lateralis (GL).

Methods: We trained deep neural networks using 1772 ultrasound images of 153 participants of different age groups (9 to 36 images per participant) acquired in previous studies by three operators (n = 153 (25 females, 128 males), age = 38.2 years (13 to 78 y)). Images of the RF, VL and GM/GL were captured with three devices (1. ACUSON Juniper, SIEMENS Healthineers, Erlangen, Germany; 2. Aixplorer Ultimate, SuperSonic Imagine, Aix-en-Provence, France; 3. Mylab 70, Esaote Biomedica, Genova, Italy) using EFOV ultrasonography while participants were lying supine with their legs extended and feet on the bed. Because of regional differences in muscle size and shape, we acquired images of the RF and VL in 10% increments from 30 to 70% of femur length. We acquired images of the GM and GL at 30 and 50% of muscle length. For each muscle, we randomly divided the images into a training set (n = 1127) for the deep neural network and a validation set (n = 90). Prior to model training, images and binary area masks were augmented using height and width shift, rotation, and horizontal flipping. Images were normalized and resized for training. Within the training data set, we applied a random 90/10% training/test data split. We trained one model for each muscle using a U-net architecture (Cronin, Finni, and Seynnes 2020). A RTX3060 GPU was used for model training with a limit of 50 epochs and a batch size of one. We employed the Adam

optimizer and initiated the learning rate to 10-5. We used binary cross-entropy as a loss function and early stopping to reduce the risk of overfitting. During training, the model performance was evaluated using the intersection over union measure. When model training was complete, we measured the ACSA in all images of the validation set using DeepACSA with our trained models and compared it to manual segmentation, which was in every instance conducted before automated analyses. The validation set for the RF and VL consists of 90 images, whereas the validation set consists of 65 images for the GM and GL. The DeepACSA code is written in Python using a Keras frontend with a Tensorflow backend for model training and includes a graphical user interface as well as the pre-trained models.

Results: The training of the deep neural network required 23 to 38 epochs. Comparing DeepACSA analysis of the RF to manual analysis resulted in intra-class correlation (ICC), mean difference and standard error of the differences (SEM) of 0.96 (95% CI 0.939,0.973), 0.31 cm2 (0.04,0.58) and 0.91 cm2 (0.47,1.36). For the VL, ICCs, mean differences and SEMs were 0.941 (0.911,0.96), 0.25 cm2 (-0.21,0.7) and 1.55 cm2 (1.13,1.96). The GM/GL muscles demonstrated ICCs, mean differences and SEMs of 0.968 (0.948,0.98), -0.01 cm2 (-0.25, 0.24) and 0.69 cm2 (0.52,0.83). Comparability was increased for all muscles when wrong predictions of the model were removed based on visual inspection of the output. Whereas the time needed to manually segment ten ultrasound images is about ten minutes, DeepACSA requires thirty seconds for automatic segmentation on a common CPU and provides comparable results.

Discussion/Conclusion: The ACSA of quadriceps muscles is an important indicator for frailty but also related to isometric knee extension strength in healthy adults or elite sportsmen (Trezise et al. 2016). As ultrasound can be used to assess the ACSA of lower limbs muscles, it follows that automating the process of image analysis would allow to analyze images in large cohorts. The segmentation of DeepACSA of RF, VL and GM/GL muscles in EFOV ultrasound images yielded comparable results to manual segmentation. Therefore, the DeepACSA tool can (automatically) segment lower limb muscles in EFOV ultrasound images using deep neural networks. DeepACSA is novel, because it objectifies and accelerates the evaluation process of EFOV ACSA ultrasound images, allowing large datasets to be evaluated quickly. However, our results demonstrated that visual inspection of the output may still be necessary to optimize predictions and avoid misclassifications. Following publication, DeepACSA code including a graphical user interface, our pretrained models and instructional material on how to use DeepACSA will be openly available. This is relevant because it allows a straightforward usage without programming knowledge required. Future approaches should apply more (variable) input images and compare the performance of several deep neural networks (i.e., varying the encoder path of the U-Net model).

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Trezise, J., N. Collier, and A. J. Blazevich. 2016. 'Anatomical and Neuromuscular Variables Strongly Predict Maximum Knee Extension Torque in Healthy Men'. European Journal of Applied Physiology 116(6):1159–77. doi: 10.1007/s00421-016-3352-8.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Training Interventions to Prevent Sport-Related Concussions – A Systematic Review.

Authors:

Zimmermann, S.[1], Kubica, C.[2], Nigg, C.R.[2].
[1]University of Basel
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Abstract:

Introduction: Evidence has shown that long-term cognitive and physical restrictions after a sport-related concussion (SRC) negatively impact an athlete's further life. SRCs can even lead to cognitive impairment, depression, dizziness, and earlier onset of Alzheimer's disease (Guskiewicz et al., 2005). Several primary prevention strategies were developed, such as protective equipment, education, and rule-change to decrease SRC incidence. Besides those strategies, physical fitness and strength levels can impact the SRC risk (Kontos et al., 2006). To date, less is known about the effectiveness of training interventions to protect athletes from SRCs. Therefore, this review aims to summarize the current literature about training intervention programs to prevent SRCs in athletes.
Methods: A systematic literature search was conducted according to the PRISMA guidelines (Liberati et al., 2009) in June 2021. Inclusion criteria were: peer-reviewed studies, with a prospective, analytical study design, written in English or German, evaluating the effect of primary prevention training interventions to reduce SRC incidences in an athletic population (female and/or male athletes, over the age of 14, all performance levels). Exclusion criteria: other primary prevention strategies (protective equipment, policy and rule changes, or concussion education), prevention of general traumatic brain injuries, participants under the age of 14, abstracts, conference papers or reviews, other study designs such as case series and case studies, and articles written in other languages than in English or German.
Results: A total of 672 articles were identified. After duplicate removal and title, abstract, and full-text screening, four studies met the inclusion criteria. The following training interventions were analyzed: strength and movement control exercises (n=2); vision training (n=1); and tackling technique (n=1). Training programs with strength and movement control exercises showed a 30% and 60% incidence reduction of SRCs among rugby players. Vision training stated 5.8x fewer cases of concussion during the intervention period and tackling technique training led to a 30% reduction of head impact athlete-exposures in American football athletes.
Discussion/Conclusion: This systematic review provides an overview about current training intervention strategies to prevent SCRs. The results indicate positive effects of training programs, including strength and movement control exercises, vision training, and tackling techniques to decrease SRCs' incidence. Besides the positive indications, no synthesis of results was possible due to the high diversity of study designs and the lack of standardized and comparable incidence assessments. More studies are needed with standardized incidence assessments and a higher variety in analyzed sports and athletic populations, including female athletes and long-term follow-ups, to provide recommendations for effective training intervention strategies.

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Guskiewicz, K. M., Marshall, S. W., Bailes, J., McCrea, M., Cantu, R. C., Randolph, C. & Jordan, B. D. (2005). Association between recurrent concussion and late-life cognitive impairment in retired professional football players. Neurosurgery, 57(4), 719-726.

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Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., ... & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. Journal of clinical epidemiology, 62(10), e1-e34.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Development and evaluation of a web application for recovery management in junior ice hockey players

Authors:

Ketelhut S[1], Paul C[2], Koschnick D[2,3], Thom S[1,4], Lenze L[4,5], Stegmann P[4,5], Nigg CR[1]

[1]Department of Health Science, Institute of Sport Science, University of Bern, Switzerland
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[3]Technische Universität Berlin, Germany
[4]SC Bern, Switzerland
[5]Department Sport Sociology and Management, Institute of Sport Science, University of Bern, Switzerland

Abstract:

Introduction: Recovery monitoring is a fundamental component for continuous performance enhancement in sports and exercise (Kellmann, 2002). As recovery is regarded as a multifaceted restorative process, different physiological and psychological measures ought to be monitored on a daily basis. In this regard, digital applications can help to collect, merge, and summarize the data easily. The present research project developed and evaluated a web application for recovery management using validated measurement instruments.

Methods: 52 male junior ice hockey players (16.5±1.4 years) from the SC Bern performed a daily recovery monitoring over four weeks using the specially developed web application hieros. Various objective and subjective standardized instruments determining the stress and recovery status were applied and evaluated by the web application using a specific algorithm. The results were summarized in an overall recovery score. This score was validated by means of validated questionnaires (Short Recovery and Stress Scale (SRSS); Acute Recovery and Stress Scale (ARSS)) (Kellmann et al., 2016).

Results: The recovery score of the web application showed strong positive correlations (t_1: $r = 0.902$; t_2: $r = 0.857$, t_3: $r = 0.915$, t_4: $r = 0.942$; $p < 0.01$) with the recovery scale and strong negative correlations (t_1: $r = -0.569$, t_2: $r = -0.809$, t_3: $r = -0.782$, t_4: $r = -0.902$, $p < 0.01$) with the stress scale of the SRSS at all four measuring time points. For the ARSS, there were strong positive correlation ($r > 0.5$, $p < 0.05$) for all recovery-related scales at all four measuring points. Concerning the stress-related scales there were strong negative correlations ($r > 0.5$, $p < 0.01$) throughout all time points.

Discussion/Conclusion: The web application hieros can validly assess the recovery status of young athletes in everyday training. Thus, it may present a valuable tool for recovery monitoring in different team and individual sports. Future randomized controlled trials assessing additional outcomes should be conducted to further validate the recovery score of this web app.

References:

Kellmann, M. (2002). Underrecovery and overtraining: Different concepts – similar impact? In M. Kellmann (Ed.), Enhancing Recovery (pp. 3-24). Champaign, IL: Human Kinetics.

Kellmann, M., Kölling, S., & Hitzschke, B. (2016). Das Akutmaß und die Kurzskala zur Erfassung von Erholung und Beanspruchung im Sport Manual [The acute measure and the short scale for the assessment of recovery and stress in the sport – Manual]. Hellenthal: Sportverlag Strauß.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Oral Session

Wednesday 09.02.2022

10:15 – 11:45

Room 2420 **Sport Performance**
Chair: G. Millet

Prediction of competition performance based on technique tests in Olympic air rifle shooting
D. Tartaruga

Decremental exercise protocol as a training stimulus: more or less efficient than traditional high-intensity interval training?
FG. Beltrami

In which haystack is the needle hidden? Finding tomorrow's professionals with a 10-years longitudinal person-oriented study based on (corrected) motor performances in football.
B. Charbonnet

Investigating the use of peripheral vision in 3vs3 counter-attack situations in football
C. Vater

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Prediction of competition performance based on technique tests in Olympic air rifle shooting

Authors:

Tartaruga D[1,2] & Kredel R[2].

[1]Swiss Shooting

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Abstract:

Introduction: The primary goal in sport shooting is to maximize the number of center hits. To achieve this, the aiming point trajectories on the target must be minimized or made predictable. This can be achieved by optimally controlling the contact forces on the sports equipment (Kredel, Tartaruga, Siegenthaler & Hossner, 2014). The quality of aiming point trajectories can be described by different features that functionally interact for an optimal result and inform a specific technique. Since Swiss Shooting currently selects athletes only based on yearly competition results, the question arises which benefit this selection concept would gain by adding technique characteristics. To that aim, different prediction models are calculated and interpreted in this study.

Methods: Since 2009, all FTEM-T3-ranked and higher-ranked athletes of Swiss Shooting have been sending training data of aiming point trajectories which were recorded with a SCATT training system (100 Hz). Currently, the database contains 140'610 air rifle shots of 321 athletes. Each training data set consists of at least 40 shots, so that measures for holding stability, approach, aiming, and release quality of each individual shot can be determined and aggregated to a technique score (TS). This TS was linearly scaled between 0 (worse than 10% of all available shots) and 100 (better than 2.5% of all available shots). Based on these data, three different prediction models are tested:

(1) past competition results (PCR) on future competition results (FCR)
(2) technique score (TS) on future competition results (FCR)
(3) past competition results (PCR) and technique score (TS) on future competition results (FCR)

Only competition results achieved between 2 to 4 months after a PCR/TS were considered for the prediction. The quality of the prediction was operationalized by the coefficient of determination R^2.

Results: 2 to 4 months old PCR explained 65.3% of the variance of FCR, while 54.1% of the variance of FCR can be explained by 2 to 4 months old TS. The combined model PCR and TS can explain 69% of the variance in competition results achieved 2 to 4 month later.

Discussion/Conclusion: A combination of PCR and TS in the period 2-4 months before the FCR explains almost 5% additional variance of the FCR than pure PCR. Therefore, the benefit of combining the prediction models is not directly obvious. Rather, it seems that most of the explanatory content of the TS is already contained in the PCR, which is supported by the high explanatory content of the TS alone of over 50%. Three consequences result from these results for the selection practice: (1) If current competition results are available for the individual athlete, they allow a good prediction of future competition performances. (2) If current technique scores from training sessions are also available, the prediction quality can be marginally improved by adding them. (3) If no current competition results are available, the technique scores from training alone can clarify a considerable proportion of future competition performance.

References:

Kredel, R., Tartaruga, D., Siegenthaler, R., & Hossner, E.-J. (2014). Präzisionsleistungen im Olympischen Luftgewehrschiessen. In (o. Hrsg.): 6. Jahrestagung der Sportwissenschaftlichen Gesellschaft der Schweiz (SGS). Sportwissenschaft in Bewegung - Bewegung in der Sportwissenschaft. Freiburg. 13.-14.02.2014

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Decremental exercise protocol as a training stimulus: more or less efficient than traditional high-intensity interval training?

Authors:

Beltrami FG [1], Kälin S [1], Spengler CM [1].

[1] Exercise Physiology Lab, Institute of Human Movement Sciences and Sport, ETH Zurich.

Abstract:

Introduction: A high-intensity interval sessions based on decremental exercise loads (DEC) has been shown to elicit higher levels of physiological perturbation in trained cyclists compared to a traditional, even-paced session (TRA). The purpose of this study was to examine whether a training period including either DEC or TRA would lead to differences in performance increments during a 40-km time-trial (TT40) in well-trained cyclists.

Methods: On separate visits, twenty cyclists performed an incremental test to determine peak power output (PPO), the lactate threshold (determined using D_{max}), maximal cardiac output (using thoracic bioimpedance) and maximal oxygen uptake ($\dot{V}O_{2max}$), plus a TT40 on an ergometer, which was preceded by a standardized warm-up used to determine gross efficiency. All testing was repeated to account for any familiarization effects (Baseline). Participants then trained unsupervised for four weeks, during which their individual training routine was recorded. After this period, participants returned to the laboratory for another round of testing (PRE). Based on their $\dot{V}O_{2max}$, participants were then allocated to the DEC or TRA groups in random order or were designated as a match to a participant from the other group. Both groups performed 4-weeks of supervised high-intensity training in the laboratory (3 x per week). The sessions consisted of 4 x 4 min intervals at 80% of PPO with 3 min of active recovery in between. Power output was held constant for every bout within TRA (N = 10, 3 female) whereas power started 40 W higher and finished 40 W lower than average within each bout of DEC (N= 10, 2 female). Training loads during the 4-week period were adjusted based on physiological and perceptual responses during the preceding session and the warm-up of the day, which was kept constant throughout the training period. At least 48 h after the last training session, participants returned to the laboratory for post training assessments (POST). All comparisons were performed using 2-way ANOVA (factors time and group) with significance set at $P < 0.05$.

Results: No significant differences were noted between the baseline and PRE time-points between any of the performance measures. There was no difference in time spent above 90% heart rate max per supervised session between the groups (12.1 ± 3.9 vs. 11.3 ± 2.7 min for DEC and TRA respectively, P = 0.603). TT40 performance significantly improved from PRE to POST training (factor time, $P < 0.001$), with a 1.3% reduction in time in DEC (64.63 ± 4.75 vs. 63.79 ± 4.80 min) and a 2.9% in TRA (66.12 ± 5.36 vs. 64.17 ± 5.54 min). This difference was not significant between the groups (group * time interaction P = 0.122). PPO (factor time P= <0.001) as well as power at the lactate threshold (factor time P = 0.002) increased from PRE to POST training, again without differences between the two groups. Neither $\dot{V}O_{2max}$, peak cardiac output nor gross efficiency showed significant differences following the training program.

Discussion/Conclusion: Both DEC and TRA interventions were effective in enhancing TT40 performance. Performance improvements seemed related to the ability to sustain a higher percentage of maximal $\dot{V}O2max$ during the time-trials, as seen from the higher power at the lactate threshold, rather gains in efficiency or aerobic capacity. Contrary to our hypothesis, high-intensity interval training based on decremental loads did not lead to further gains in performance compared to a traditional, even-paced approach.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

In which haystack is the needle hidden? Finding tomorrow's professionals with a 10-years longitudinal person-oriented study based on (corrected) motor performances in football

Authors:

Charbonnet B[1], Sieghartsleitner R[1], Schmid, J[1], Conzelmann A[1].

[1]Institute of Sport Science, University of Bern, Switzerland

Abstract:

Introduction:

There is a consensus among sport scientists that the motor subsystem (i.e., technical skills and physical fitness) plays a significant role in the talent identification process in elite football (Williams, Ford, & Drust, 2020). However, when it comes to use motor test results to predict the career outcome of adolescent football players (i.e., professional vs. non-professionnal), two concerns have been raised: (1) Some test results (especially in the area of physical fitness) are highly dependent on maturity status (Albaladejo-Saura, Vaquero-Cristóbal, González-Gálvez, & Esparza-Ros, 2021). In particular, compared with less mature players, the more mature ones achieve better (current) performances. As a consequence, systematic error is introduced in the assessment of potential (overestimation for early maturers and underestimation for late maturers; Cripps, Hopper, & Joyce, 2016) and ultimately in the selection decisions (Johnson, Farooq, & Whiteley, 2017). (2) Talent has been recognized as a developmental phenomenon. Therefore, in order to explain it, it seems appropriate to draw on theories of development, which are currently dominated by a dynamic-interactionist view (Magnusson & Stattin, 2007). In accordance with this view, one should expect the motor subsystem to be modelled in its totality with its dynamic interactions. Unfortunately, the statistical methods currently used as scientific motor prognostic models (e.g., linear regressions) fail to meet this demand and capture only the isolated (or additively aggregated) effects of the motor talent criteria (theory-problem-mismatch; Conzelmann, Zibung, & Zuber, 2018).

Methods: To deal with the first problem, this study developed and implemented a correction mechanism which captures the influence of the maturity status on several physical fitness tests (see below) and gives back corrected (i.e., maturity-independent) test results for further analysis. To operationalize the maturity status in this correction procedure, the common variance of four pragmatic estimation methods was used, i.e., Mirwald, Moore-1, Moore-2, Fransen, which was extracted by means of a principal axis factoring (*KMO* = .78; R^2 = 96%).

To deal with the second problem, a (theory-conform) person-oriented method was used (i.e., LICUR; Bergman, Magnusson, & El-Khouri, 2003). In the first step, it classified 149 elite football players (M_{age} = 13.55; *SD* = 0.32) into different types based on their performance in six motor tests (technical skills: juggling, passing, dribbling; *corrected* physical fitness: sprint, jump and intermittent endurance). In the second step, it was examined how likely it was for each type of players to reach the professional level ten years later (1st to 3rd league in Switzerland or professional contract abroad; n_{pro} = 28 vs. $n_{non\text{-}pro}$ = 121).

Finally, one-way ANOVAs were calculated to detect differences between each type of players in terms of maturity status (factor score), personality (win and goal orientation, fear of failure, hope for success, and self-determination), training quantity (hours spent in club training, free play and other sports up to the age of 12), trainings quality (years of football education spent in professional club up to the age of 12), familial support (financial and time investment, priority between school and sport, importance of football within family) or coaches' anticipation regarding future playing level.

Results: Four types of players were identified (EESS = 43.47%; HCmean = 1.16; SC = 0.50): The 1) technically strong, but physically weak (n = 25), the 2) average (n = 61), the 3) physically strong (n = 37) and the 4) below-average players (n = 26).

Interestingly, there were some notable differences between the types in the success rate of turning professional ten years later (44%, 16%, 11% and 12%, respectively). Players who were *technically strong, but physically weak* had a 5-fold increased probability of becoming professionals (*OR* = 4.95 [1.93; 12.67], $p < .01$), while the others had no significant success probability. No differences were

found between the four types of players regarding maturity status, personality, training history and familial support. Coaches anticipated that the below-average players had poorer prospects for success than the technically strong, but physically weak and the physically strong players ($p < .05$).
Discussion/Conclusion: On the one hand, this study is in line with theoretical expectations by using a person-oriented approach optimized with maturity-related correction procedure in the area of physical fitness. In doing so, differential insights into the influence of the motor subsystem on career outcomes could be gained. First, our analysis showed that it was not necessary to have an above-average performance in all motor tests to be successful later on. Accordingly, the developmental clues about chances of future success did not lie in the sum of the parts, but in the complexity that was hidden behind the parts (i.e., the emerging patterns). Specifically, the most promising type (technically strong, but physically weak) was characterised by outstanding scores in the juggling test. Second, the holistic considerations of the motor subsystem allowed us to uncover a (non-random) compensation mechanism: While good technique could compensate for poor maturity-independent physical fitness, the opposite did not apply. Interestingly, all four types of players had the same training history, familial support, and motivation. This means that exogenous factors could not explain their initial differences in technical skills and physical fitness and that these differences may be due to specific genetic predispositions (Missitzi et al., 2013; Zempo et al., 2017). On the other hand, this study is in line with practical expectations by identifying a particular type of players (technically strong, but physically weak), out of which 44% became professionals ten years later. This high success rate (compared to the low success rate of the physically strong players; 11%) imply that a below- or above-average corrected physical fitness level at the age of 13 do neither hinder nor promote a player's career. Given the high trainability of the physical fitness during and after puberty (Lloyd & Oliver, 2012) and its different relevance depending on the playing position (Roberts, McRobert, Lewis, & Reeves, 2019), coaches should be made aware that a maturity-independent physical disadvantage could be made up for later (through individualized training or positional adjustments). Furthermore, such a disadvantage may hypothetically be associated with positive consequences in the long term, as it could force the players to adapt and develop superior tactical strategies in order to remain competitive. Finally, the practical relevance of the striking difference observed between the four success rates is all the greater because, surprisingly, coaches did not anticipate that the technically strong, but physically weak players had greater prospects for success than the physically strong or average players (i.e., coaches were capable of distinguishing the good players from the “bad” ones, but not the good from the very good ones). Accordingly, the results speak for the consideration of a person-oriented approach based on (corrected) motor performances to sharpen the coaches’ eye and refine current scientific talent identification procedures.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Investigating the use of peripheral vision in 3vs3 counter-attack situations in football

Authors:

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Abstract:

Introduction: In a recent review, peripheral vision has been reported to be functional in team-sports when monitoring the movements of multiple players (Vater, Williams, Hossner, 2019). As an example, expert soccer players report to use their peripheral vision in 3 vs. 3 football situations in on-field decision-making tasks (Vater, Luginbühl, Magnaguagno, 2019). It seems that they anchor their gaze on the player possession of the ball to monitor peripheral events (e.g., movements of other players). In this experimental study, we challenged the use of peripheral vision by varying the viewing angle between the direct opponent of the participant and other wing strikers in a virtual-reality counter attack situation.

Methods: Seventeen experienced football players were shown 3 vs. 3 virtual-reality football counter-attack situations from the perspective of the central defender. Their task was to detect the outrun of a wing striker on the right or left while monitoring their direct opponent who is about to pass to the striker that outruns his defender. In case there was an outrun on one side, a defensive movement to the right or left direction should be initiated as before the pass was played, ensuring that they would monitor the peripheral players and not wait for the pass. In half of the trials, both wing strikers out-ran their defenders, so that a correct decision was to move after the direct opponent played the pass. As an independent variable, the eccentricity of the right and left winger was systematically varied (20°, 30°, 40°, 50°, 60°; angle between direct opponent and wing striker). Decision-accuracy and the range of head movements (the smaller the range the higher the probability of using peripheral vision) was examined. Head orientation and body movements were captured with a 14-camera Optitrack system to assess if participants moved before or after the pass. It was predicted that the range of head movements would increase as a function of eccentricity as acuity in peripheral vision is too low to process information peripherally.

Results: The results showed that there was no difference in decision-making accuracy between eccentricities, $F(4, 16) = 2.05$, $p = .32$, $\eta_p^2 = .10$. When comparing the range of head movements, there was a significant difference between eccentricities, $F(4, 16) = 12.05$, $p < 0.01$, $\eta_p^2 = .41$. A larger range of head-movements was observed with increasing eccentricities. Largest differences appeared between eccentricities 20° and 60° ($p < 0.001$).

Discussion/Conclusion: Orienting the head and eyes to relevant information sources is crucial in football decision making. The current results indicate that football players have distinct orientation strategies as a function of the eccentricity of to-be-monitored players. It seems that a head orientation to the direct opponent and the use of peripheral vision is a common strategy when decisions are made under time pressure as it is the case in counter at-tacks in football. This anchoring strategy only works if wing strikers are presented at small viewing eccentricities. With greater eccentricities, visual acuity in peripheral vision becomes too low, so that players need to compensate the loss in resolution with head movements.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Oral Session

Wednesday 09.02.2022

13:30 - 14:50

Room 2218 **Physical Activity & Health**

Chair: D. Neyroud

The SOPHYA cohort on objectively measured physical activities trajectories in Swiss youth: Who remains in the organised sport setting and who benefits from it?
J. Hänggi

Appropriate use of theory does make a difference in promoting physical activity for older adults
S. Schnegg

School-based physical activity and cognition – what is the optimal level of cognitive challenge to foster children's inhibition?
S. Anzeneder

Prospective associations of physical fitness with spinal flexibility in childhood: implications for primary prevention of non-specific back pain
S. Bade

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

The SOPHYA cohort on objectively measured physical activity trajectories in Swiss youth: Who remains in the organised sport setting and who benefits from it?

Authors:

[1]Johanna Hänggi, [1]Bettina Bringolf-Isler, [1]Emmanuel Schaffner, [2]Bengt Kayser, [3]Suzanne Suggs, [1]Nicole Probst-Hensch

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[3]Institute of Communication and Public Policy, University della Svizzera italiana, Lugano, Switzerland

Abstract:

Background and Objective: The SOPHYA 1 study is the first Swiss-wide population-based study reporting accelerometer-based measured physical activity (PA) in youth. At baseline in 2014/15 1230 children and adolescents aged 6 to 16 years participated and wore accelerometers for 7 days. We investigated the association of children's PA with socio-economic, familial and environmental characteristics. In addition, the PA levels were linked to health outcomes. By transforming the SOPHYA 1 study into a cohort, we aim to study the longitudinal trajectory of PA from childhood to adolescence and from adolescence to young adulthood and the association of these trajectories with baseline characteristics. A special focus concerns organised sport including Youth and Sport (Y+S) which is one of the largest providers of organised sport in Switzerland. We investigated whether organised sport and specifically Y+S, result in equal sport opportunities for all children, whether Y+S keeps all children physically active, or whether Y+S mainly reaches physically active children.

Methods: In 2018/19, SOPHYA-1 participants with valid accelerometer data at baseline, were contacted again and asked for a second participation. Consistent with the study design at baseline, the first participant contact was a telephone interview about their PA and sport behaviour. Next, accelerometers for the child and at least one parent were mailed to consenting families. A questionnaire on health, well-being, lifestyle, injuries and perceptions of the local neighbourhood and a time-activity diary was completed in paper format. In SOPHYA-2 a total of 447 participants had valid accelerometer data at follow-up. To get detailed information on Y+S participation frequency and intensity, the SOPHYA-2 study participants who provided consent where linked to the Y+S Database which includes all Y+S activities between 2008 and 2020.

Results: Socio-economic obstacles do not seem to prevent families from allowing their children participate in organised sport and were even less pronounced in Y+S. In particular voluntary school sport appears to be an accessible offer that reaches children and adolescents from different socio-economic backgrounds. The strongest predictor for dropping out of organised sport or Y+S was the PA behaviour at SOPHYA 1 baseline: Children and adolescents who dropped out of organised sport or Y+S were already less active five years earlier. The termination of school as well as being overweight were associated with leaving the Y+S programmes. Parents' attitudes had an influence on children's and adolescent's adherence to organised sport. Our data show that the more children and adolescents were participating in Y+S, the more active they became. However, organised sport attracts children and adolescents who are already more active while those who are less physically active at baseline are less likely to remain in organised sport and Y+S.

Conclusion: The SOPHYA cohort provides insight into the relationship between the development of PA from childhood to adolescence, adolescence into young adulthood and participation in organised sports. Y+S helps to get children and adolescents more physically active, but strategies must be found to ensure that those who are less active and less keen on doing organized sport enter and adhere to the Y+S program, as from a health-related perspective, they would benefit the most from getting more active.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Appropriate use of theory does make a difference in promoting physical activity for older adults

Authors:

Schnegg S[1], Dütschler B[1], Nigg CR[1]

[1]Department of Health Science, Institute of Sport Science, University of Bern, Switzerland

Abstract:

Introduction: Regular physical activity (PA)has positive effects on mental and physical health and well-being. Especially for older adults, PA helps to increase health related quality-of-life and improve cognitive functions (Chodzko-Zajko et al., 2009). Despite these PA benefits for older adults, low participation is indicated and there is a trend of decreasing PA with increasing age (Jefferis et al., 2014). To prevent this decline and motivate older adults to be active, the application of health behavior theories are strongly recommended (Downs et al., 2013). It is often hypothesized that the use of theories will make interventions more effective (Davis et al., 2015). However, little research exists that investigates this hypothesis. Nigg andPaxton (2008) generated the Litmus Test of Theory Use to evaluate the use of theory through height questions:

1.Is a theory identified?
2.Is the (entire) theory described?
3.Are all of the theory components translated into the intervention?
4.Are all of the intervention components implemented?
5.Are all of the theory components assessed?
6.Are the theory variables and the outcome congruent?
7.Did the mediators change during an intervention?
8.Did the outcome change?

The purpose of this study was to evaluate how well theory is used in PA interventions specific for older adults. Specifically, it was investigated: How often (a) and how well (b) are health behavior change theories used in PA interventions for older adults? And (c) is the quality of theory implementation related to the intervention outcome and if yes, how?

Methods: Studies were selected if they have previously been reviewed in the meta-analysis interventions to increase physical activity among older adults by Chase (2015; the largest recent review of older adult PA interventions) and met the following additional inclusion criteria:

•Published in or after 2000 (to ensure relevancy of results)
•Mean age of at least 65 years
•n >20
•Randomized controlled trial
•Peer reviewed
•Study had (among others) a PA outcome measure (reported)
•Healthy older adults (e.g., no major illness)
•Intervention was some kind of health program (e.g. no acute effects).

The answer to each Litmus Test question was scored 0for “no” or “not reported”, 0.5 for “partially described/done” or 1 for “yes”. A total score of the Litmus Test for each study was calculated and the standardized effect size of each PA-intervention was calculated. Pearson’s correlation between the standardized effect size and the Litmus Test total score was calculated.

Results: The majority (90.9%) of the 22 included studies identified a theory on which they based their intervention at least to some extent. The mean Litmus Test score was 4.8 (SD=2.0) indicating an overall moderate theory application quality. A small positive correlation between the quality of theory implementation for interventions and the PA-outcome was found ($r= 0.27$, $p<.05$).

Discussion/Conclusion: Davies et al. (2010) reviewed over two hundred studies from 1966 to 1998 in their meta-analysis. Only 22% of these studies applied a theory of which even less (almost 8%) explicitly used and worked with one or more theories. In the studies they examined, the choice of intervention could not be adequately justified, and until at least 1998, theories were often poorly applied or not applied at all. Bartholomew & Mullen (2011) confirm that more recently the predominant opinion in the field of health-related behavior change is that effective interventions

are guided by theories. To accomplish this, they present methods and examples of how researchers effectively select an appropriate theory and use it adequately in their research design, testing, and study reporting. Regarding the research question of how well health behavior change theories are used in older adult PA interventions, a theory could be identified, but very often it was not described or not described completely. Almost all of the studies (20/22) involved a theory somehow. A discrepancy could be seen concerning the mediators where often they were not recorded or no change could be seen during the intervention; whereas the outcome almost always changed. That the mediators are often not recorded, or simply are not affected by the intervention, replicated findings of Nigg and Paxton (2008). This is an important consideration as Stewart and Klein (2015) state that when behavior-change theories are incorporated, findings are generated that make it clearer how and why an outcome has changed. Based on the small correlation found and the state of research to date, theory application and reporting should be improved within the older adult PA field and, if replicated, potentially the broader health behavior change field. In addition to the Litmus Test, Willmott and Rundle-Thiele (2021) suggest a standardized framework that supports theory application and reporting in health behavior interventions. Precise, consistent, and high quality application and reporting of theory in health interventions will allow better comparison across different studies and increasing probability of intervention effectiveness, thereby progressing knowledge of behavior change. In the studies discussed, a wide range of health behavior theories were used. More research is needed to identify which behavior change theories are most effective in which context to increase the PA-level for older adults in particular.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

School-based physical activity and cognition – what is the optimal level of cognitive challenge to foster children's inhibition?

Authors:

Anzeneder S[1], Benzing V[1], Schmidt M[1].
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Abstract:

Introduction: Acute bouts of Physical Activity (PA) have the potential to promote children's cognition. However, not all forms of PA benefit cognition equally. An increasing number of investigations have focused on the qualitative – e.g., coordinative and cognitive – characteristics of the PA tasks and shown inconsistent results, calling for a more nuanced exploration of the level of cognitive challenge in PA necessary to reap cognitive benefits[1]. Thus, aim of this study was to investigate which level of cognitive challenge in PA may benefit aspects of children's cognition that are relevant for school and life achievements as inhibition and attention networks.

Methods: In a within-subjects experimental design, 109 children (5th and 6th graders; M_{age} = 11.12, SD = 0.96, 48% female) participated, in three 15-minutes exergame sessions, one week apart in counterbalanced order, with constant physical exertion (65% HR_{max}) but different levels of cognitive challenge (low, mid, or high with respect to the individual ongoing performance). Cognitive inhibition and attention networks' performance were assessed after each exergame session by a modified child-adapted attention network test (ANT-R[2]).

Results: Manipulation-check analyses revealed significant differences in perceived cognitive challenge between the high and the two lower conditions (*ps* < .003), but no significant differences in physical exertion (*ps* > .05). A 3 (cognitive challenge: low, mid, high) x 4 (cue conditions: no, double, valid, invalid cue) x 2 (flanker conditions: congruent, incongruent) repeated measures ANOVA, used to analyze reaction times (RT), revealed classic cue-, flanker-, and cue x flanker effects, as well as an interaction between cognitive challenge and flanker condition ($F(2, 214) = 7.76$, $p = .004$, $\eta^2_p = .05$). Post-hoc analyses of RT difference data (incongruent – congruent, i.e., executive control network efficiency) revealed a better performance after the high challenging condition compared to both lower ones (high vs. mid: Z = -2.58, $p = .010$; high vs. low: Z = -3.07, $p = .002$; *adjusted p* = 0.012). The same analysis performed on accuracy data did not yield significant results.

Discussion/Conclusion: The results suggest that acute bouts of PA with high cognitive challenge may benefit children's inhibition, extending what found in younger adults[3]. The results may be interpreted in the light of the arousal theory and cognitive stimulation hypothesis. Acute PA might stimulate available resources and its cognitive complexity might specifically activate the brain regions underlying higher-order cognition.

References:

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[3]Chang, Y.K., Pesce, C., Chiang, Y.T., Kuo, C., & Yand Fong, D.Y. (2015). Antecedent acute cycling exercise affects attention control: An ERP study using attention network-test. *Frontiers in Human Neuroscience, 9*, 9:156. doi: 10.3389/fnhum.2015.00156.

SPORTWISSENSCHAFTLICHE
SOCIETE SUISSE DES
GESELLSCHAFT DER SCHWEIZ
SCIENCES DU SPORT

Title:

Prospective associations of physical fitness with spinal flexibility in childhood: implications for primary prevention of non-specific back pain.

Authors:

Bade, S[1], Lona, G[1], Infanger, D[1], Endes, K[1], Roth, R[1], Faude, O[1], Hanssen, H[1]

[1]Department of Sport, Exercise and Health, Medical Faculty, University of Basel, Basel, Switzerland

Abstract:

Introduction: Back pain is a worldwide health hazard and the world's leading cause of years lived with disability with the highest figures in Western Europe. The high costs involved are a socioeconomic healthcare burden. The occurrence of initial back pain is already observed in childhood and the prevalence is increasing with age. Back pain in childhood and adolescence has been shown to predict development of back pain in adulthood. That underlines the importance of primary prevention and thus the definition of early predictors of back pain in childhood.
Therefore, this study aimed to investigate the longitudinal association between physical fitness and spinal flexibility in relation to and as a predictor for the development of non-specific back pain in prepubertal children after four years of follow-up.

Methods: In this prospective cohort study with 4-year follow-up school children from the Swiss Canton Basel-Stadt, aged 6-8 (2014) at baseline and 10-12 years (2018) at follow-up, were recruited from 26 primary schools within a mandatory evaluation of motor skills.
Data for spinal flexibility were collected by use of a hand-held computer-assisted device and physical fitness was assessed by shuttle run performance at both time points. Occurrence of non-specific back pain was determined by use of a questionnaire at follow-up.

Results: Children with higher physical fitness at baseline achieved a better spinal flexibility four years later (β [95% CI] 3.75 [2.19–5.3] degree per 1 stage increase, $p<0.001$). Higher spinal flexibility by 1 degree at baseline was associated with 2% less odds for non-specific back pain at follow-up (OR [95% CI] 0.98 [0.97–0.99] per 1 degree increase, $p=0.032$). There was little evidence for a direct association between physical fitness at baseline and development of non-specific back pain at follow-up (OR [95% CI] 1.13 [0.96–1.34] per 1 stage increase, $p=0.128$).

Discussion/Conclusion: Fitness performance is associated with the development of better childhood spinal flexibility over four years. Moreover, a better spinal flexibility at baseline was associated with less non-specific back pain at follow-up. This study demonstrates that physical fitness is a key modulator of spinal flexibility which itself is a main determinant of non-specific back pain during childhood development.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Oral Session

Wednesday 09.02.2022

13:30 – 14:50

Room 2420 Psychology and History of Sport

Chair: F. Carpentier

An individual exercise and sport counseling based on motives and goals. How effective is the COMET approach?
N. Schorno

Does dispositional self-control moderate the association between stress at work and physical activity after work? A real-life study with police officers
R. Schilling

Sedentary Behavior Type and Context Relate to Body Mindfulness in Everyday Life
C. Nigg

“La Fabrique des sports nationaux”. Constitution and development of the elites from several Swiss sport institutions (1860s-1930s)
G. Mayencourt

SPORTWISSENSCHAFTLICHE
SOCIETE SUISSE DES
GESELLSCHAFT DER SCHWEIZ
SCIENCES DU SPORT

Title:

An individual exercise and sport counseling based on motives and goals. How effective is the COMET approach?

Authors:

Schorno, N.[1], Gut, V.[1], Conzelmann, A.[1], Schmid, J.[1]

[1]Sport psychology and research methods, Institute of Sport Science, University of Bern, Switzerland

Abstract:

Introduction: This study tests the effectiveness of individual exercise and sport counseling in a non-clinical setting. The COMET approach (Schmid, Schorno, Gut, Sudeck, & Conzelmann, 2020) focuses on individual motives and goals and aims to identify suitable activities. Participants experience different exercise and sport activities on site and reflect on them with a counselor, who applies motivational interviewing (Miller & Rollnick, 2013).

Methods: A stratified randomized controlled design with 129 people (M_{Age} = 42.40 years, SD = 12.66 years, 67% women) over 14 weeks was used. The intervention group took part in a counseling event, which included feedback on motives and goals, trial exercise and sport sessions, and structured reflection. Four weeks later, members of the intervention group got a telephone booster focusing on troubleshooting (i.e., coping planning). The control group received minimal intervention.

Results: Results show that the counseling promoted motivational competence (η^2 = .16), physical activity-specific self-control (η^2 = .08), and the weekly volume of exercise and sport (η^2 = .15), whereas it did not influence self-concordance.

Discussion/Conclusion: The COMET approach is an effective way to foster motivation, volition, and exercise and sport behavior. Further studies can investigate whether the COMET approach is also effective in other settings.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Does dispositional self-control moderate the association between stress at work and physical activity after work? A real-life study with police officers.

Authors:

Schilling R.[1]*, Cody R.[1], Sebastian Ludyga S.[1], Brand S.[1], Faude O.[1], Pühse U.[1], Gerber M.[1]

[1]Departement of Sport, Exercise and Health, University of Basel

*corresponding author

Abstract:

Introduction: Psychosocial stress is a major health threat in modern society. Short-term effects of stress on health behaviors have been identified as relevant processes. This article examines the moderating effect of dispositional self-control on the association between stress at work and moderate-to-vigorous physical activity (MVPA) after work.

Methods: In a sample of 153 police officers (103 men, 50 women, mean age =39.3±10.4 years), daily occupational stress and hours worked were assessed via ecological momentary assessment (smartphone-based single item) in real-life. Dispositional self-control was assessed via an online questionnaire, whereas physical activity was assessed via accelerometry (ecgMove3). A hierarchical linear regression analysis was performed to test main and interaction effects.

Results: Bivariate correlations showed that perceived stress at work was positively correlated with hours worked (r=.24, p<0.001), whereas a negative association was found with dispositional self-control (r=-.27, p<0.001). After-work MVPA was neither associated with stress at work nor with dispositional self-control. The regression analysis yielded no significant interaction between stress at work and dispositional self-control on after-work MVPA.

Discussion/Conclusion: Using a state-of-the-art ecological momentary assessment approach to assess feelings of stress in real-life, stress at work did not impact after-work MVPA in police officers. More research is needed to establish whether this finding is specific to police officers or whether it can be generalized to other populations.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Sedentary Behavior Type and Context Relate to Body Mindfulness in Everyday Life.

Authors:

Nigg C[1,2], Wallman-Jones A[1], Benzing V[1], Schmidt M[1]

[1]Institute of Sport Science, University of Bern, Switzerland

[2]Institute of Sports and Sports Science, Karlsruhe Institute of Technology, Germany

Abstract:

Introduction: Mindfulness describes the mental ability to pay attention to the present, including body mindfulness through paying attention to the body and feelings of sensations (Tansay et al., 2013) and relates to health and health behaviors (Roberts et al., 2010). However, to date, body mindfulness has been mostly investigated in the context of cognitive mindfulness programs, while the role of sedentary behavior has been neglected (Yang & Conroy, 2020). Understanding these associations may provide valuable insights to promote mindfulness via intervening upon physical behaviors. Hence, the goal of this study was to investigate longitudinal associations between sedentary behavior types, sedentary behavior contexts, and body mindfulness in university students, a target group that is highly prone to sedentary behavior.

Methods: We recruited 32 university students (54% female, M_{age} = 22.35 ± 2.20 years, M_{BMI} = 23.21 ± 2.65) to participate in an observational ecological momentary assessment study. We continuously measured sedentary behavior via a thigh-worn accelerometer for seven consecutive days. Participants filled in an established state body mindfulness questionnaire (range: 0-30; Tanay et al., 2013) up to ten times a day on sedentary-triggered smartphones during everyday life. In addition, they reported the specific activity type across the last 15 minutes (e.g., watching TV) and if they were indoors or outdoors. We analyzed the data using multilevel modeling.

Results: Preliminary results revealed that if a participant was continuously sedentary for 15 minutes, body mindfulness decreased by 1.95 points (B = -0.13, p < 0.001). However, we did not observe an association between average body mindfulness and sedentary behavior (between-person level; B = 0.00, p = 0.834). Further, we found that compared to non-screen-time sedentariness, screen-time sedentariness was related to a B = 0.70-point decrease in body mindfulness (p = 0.009). Also, sedentary behavior and location interacted (B = 0.15, p = 0.008), with sedentariness indoors, but not sedentariness outdoors decreasing body mindfulness.

Discussion/Conclusion: Our results indicate that sedentariness relates negatively to body mindfulness, with the association varying across sedentariness types and contexts: Screen time sedentary behavior seems to be more detrimental than non-screen time sedentary behavior, which may be due to increasing digitization drawing away the ability to focus on bodily signals and leading to momentary disembodiment. However, outdoor sedentary behavior did not relate negatively to body mindfulness, which might be due to restorative benefits of outdoor environments that may facilitate bodily attention. Practically speaking, our results indicate that some sedentary behavior types and contexts are more detrimental than others (e.g., screen time) and thus should be avoided to prevent a decline in mindfulness. Future research should investigate sedentary behavior types and contextual factors in relation to mindfulness in daily life.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

"La Fabrique des sports nationaux". Constitution and development of the elites from several Swiss sport institutions (1860s-1930s).

Authors:

Mayencourt G.[1], Vonnard P. [1], Quin G.[1].

[1]Sport institute, University of Lausanne, Switzerland

Abstract:

Introduction:

In the second half of the 19th century, Switzerland was still a country in the middle of its nation-building process and it was important for the political elite to create a Swiss consciousness within the population. Furthemore, it was also important to diffuse democratic ideals and associations in various field were involved to support this process. Associations as the Société Suisse des carabiners (for shooting) and Société fédérale de gymnastique (for gymnastic) merged in this context, and they have to be considered as the "bras armé" of the radical-liberal movement, particularly through the organization of national festivals (from 1824 in shooting and from 1832 in gymnastic). However, a change happened around 1870 along the first steps of a "sportivization" in the Swiss society. Indeed, this period was marked by the progressive implantation of foreign "modern sports" (such as athletics, cycling and football) in several regions of Switzerland. Following the examples of shooting and gymnastic, around 1880s and 1890s national associations were created for those (new) sports in a context in which the competitive aspects, the militaries 'stakes (particularly after wars in Europe around 1870) and the obligation to do gymnastic in mandatory school (from 1874) lead to a transformation of the leaders' profiles at the top of all these associations.

Methods: Inspired by a prospographical approach, we use a FileMaker data basis to analyse the elite selected. The data basis is composed by various entries (for instance: age, nationality, family social background, formation and work, functions in sport but also in other field of society). We have selected the elite following a positional approach (that means the leaders which were actives in the board of the national sport associations).

Results: In this paper, we will present first results around the elite of three sports: Football (Association suisse de football) ; Gymnastic (Société fédérale de gymnastique) and Shooting (Société Suisse des carabiniers), meaning we are basing our analysis on a population of 514 members.

Discussion/Conclusion: Following recent studies around economic, political, cultural and scientific elite in Switzerland (conducted by the group of research *OBELIS*), this research will help to better understand the rise of these practises in Switzerland, also the relationship between all these practices, and finally, on the one hand the place of sport in Swiss society, on the other hand, the role of sport in the nation-building process.

References:

Mayencourt G., Quin G. (2021): « From Mandatory School Gymnastics to Physical Training for Youth. How the Société Fédérale de Gymnastique Became a "Gymnastic State" Dedicated to the Physical Preparation of Swiss Youth From 1873 to 1907 », *Frontiers in Sports and Active Living*, 3.

Vonnard P., Mayencourt G., Gerber H.-D. (2019), « La Fabrique des sports nationaux ». Étudier l'émergence d'une élite du sport Suisse (1860-1930), *Staps. Revue internationale des sciences du sport et de l'éducation physique*, 125 (3) pp. 151-163. Peer-reviewed.

For information about our ongoing project: https://wp.unil.ch/fabrique-sports-nationaux/

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Oral Session

Wednesday 09.02.2022

15:50 – 17:10

Room 2218 **Neuromuscular Physiology**

Chair: M. Keller

Changes in knee extensor activation pattern during exercise in response to selective prefatigue of one synergist
C. Lanfranchi

Acute effects of alcohol consumption on corticospinal parameters measured by transcranial magnetic stimulation
M. Bugnon

Can rapid magnetic stimulation of the phrenic nerves continuously ventilate healthy humans without the development of diaphragm fatigue and intolerable adverse sensory responses over time?
K.G. Boyle

Modulation of torque induced by wide-pulse, high-frequency neuromuscular electrical stimulation: implication of persistent inward currents?
T. Popesco

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Changes in knee extensor activation pattern during exercise in response to selective prefatigue of one synergist.

Authors:

Lanfranchi C, Fatton M, Place NInstituteof Sport Science, Faculty of Biology and Medicine, University of Lausanne, Switzerland

Abstract:

Introduction: The involvement of several muscles in the same motor task implies that they can contribute in a multitude of different ways to perform a movement. The resulting activation pattern could be influenced by different factors (Prilutsky & Zatsiorsky, 2002). In particular, it was observed that during a sustained isometric contraction of the knee extensors at low intensity (5% maximal voluntary contraction (MVC) force), electromyographic (EMG)activity was not stable over time for the synergists but varied between periods of high and low activity between the different quadriceps' heads (Akima et al., 2002; Kouzaki et al., 2002; Sjøgaard et al., 1986). Several authors observed that by altering the function of a single synergist by neuromuscular electrostimulation (NMES), the contribution of all synergists may be modified during a subsequent submaximal (Akima et al., 2002; de Ruiter et al., 2008) or maximal (Stutzig et al., 2012) exercise. Specifically, most of these studies observed that the decrease in EMG activity of the pre-fatigued synergist was compensated by those that were not altered. Bouillard et al. (2014) investigated the contribution of the superficial heads of the quadriceps during an isometric contraction at 20% MVC force until task failure after applying NMES for5 min on the vastus lateralis (VL)muscle. Despite the reduced VL force contribution and the reduced time to task failure, the estimated force exerted by the vastus medialis (VM) and rectus femoris (RF) muscles remained stable over time, indicating a lack of synergistic compensation for the altered VL contribution. However, it is possible that the extent of the prefatigue level is a determining factor in triggering compensatory mechanisms. In addition, insights into the link between the extent/origin of neuromuscular fatigue and potential changes in activation pattern are required. Thus, the objective of the present study was to investigate the effect of 15 min of VL NMES, as a pre-fatigue intervention, on the EMG activity of the knee extensors during an isometric contraction performed at 20% MVC force to failure. In addition, the origin and extent of neuromuscular fatigue induced by the 15-min NMES period and by the sustained contraction were investigated.

Methods: Thirteen healthy men (28 ± 5 years) completed two experimental sessions in which either the VL was prefatigued with NMES for15 min (NMES session) or no intervention was performed (control session, CONT). Then, participants were asked to sustain an isometric contraction at 20 % of MVC force with the knee extensors until task failure. The NMES intervention consisted of 30 tetanic contractions (4 son –23 s off, pulse duration: 250 µs, stimulation frequency: 83 Hz) at the maximal tolerable intensity. During the sustained contraction, EMG signal was recorded from VL, VM and RF muscles and the root mean square (RMS) was calculated for consecutive sampling periodslasting10% of the time to task failure. EMG RMS was then normalized to that determined during the MVC performed before NMES intervention/rest period. Global muscle fatigue (MVC force loss), central fatigue (reduction in maximal voluntary activation level using the twitch interpolation technique) as well as peripheral failure (decrease in M-wave and potentiated doublet amplitudes in response to supramaximal femoral nerve stimulation) were quantified in response to NMES and the sustained contraction. Statistical analysis was performed using linear mixed models to compare between conditions, time and muscles when applicable. The significance level was set at a value of $P < 0.05$. Data are presented as mean ±SD.

Results: NMES led to an MVC force loss (-26 ± 10%, $P < 0.001$) induced by peripheral alterations. Indeed, VL M-wave amplitude droppedby30.3 ± 27.9 % in NMES, while there was a limited reduction of 5.7 ± 6.4 % in CONT (time main effect, $P = 0.006$). Peak twitch force was reduced only following the NMES intervention (-13.7 ± 14.4 %, $P = 0.007$)while no central fatigue was detected There was a reduction in time to task failure in NMES compared with CONT (respectively 186 ± 75 s vs 251 ± 128 s, $P = 0.002$).EMG activity increased during exercise ($P = 0.002$) but the relative EMG

activity from VL, VM and RF muscles did not differ in CONT ($P > 0.05$).When comparing NMES with CONT, VL EMG activity remained unchanged ($P > 0.05$) while VMEMG activity(CONT: 23.5 ± 6.5 vs.NMES: 31.8 ± 10.6 % MVC RMS, $P < 0.001$) and RFEMG activity (CONT: 23.3 ± 6.3 vs. NMES: 27.5 ± 6.0 % MVC RMS, $P < 0.001$)were higher in NMES. The sustained contraction resulted in an MVC force reduction (-23.5 ±10.4 %, $P < 0.001$) similar between conditions. The drop in maximal force was associated with both peripheral (potentiated doublet evoked force loss: -17.5 ± 13.6 %, $P < 0.001$) and central (voluntary activation level loss: 95.5 ±2.8 to 89.1 ±7.9 %, $P < 0.001$) fatigue, which did not differ between conditions. M-wave amplitude remained unchanged for both conditions ($P > 0.05$).

Discussion/Conclusion: The present study shows that a selective prefatigue of the VL muscle induced an increase in EMG activity from the non-fatigued VM and RF muscles during exercise, while VL EMG activity was unchanged. These findings suggest that a compensatory mechanism between synergist muscles has occurred, but this did not prevent the reduction in performance (time to task failure). Finally, this altered activation pattern did not affect the extent / origin of neuromuscular fatigue measured after exercise.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Acute effects of alcohol consumption on corticospinal parameters measured by transcranial magnetic stimulation

Authors:

Bugnon M[1], Ruffieux J[1], Taube W[1].

[1]Department of Neurosciences and Movement Sciences, Faculty of Science and Medicine, University of Fribourg, Switzerland

Abstract:

Introduction:

Although alcohol, one of the most widely consumed drugs, affects many brain functions and induces evident behavioural changes such as locomotor impairments (Abrahao et al., 2017), its short-term effects on the motor system and in particular on the excitability of the corticomotoneuronal pathway are scarcely known. Even though the precise mechanisms are not yet fully understood, it is widely accepted that alcohol reduces glutamatergic (Lovinger & Roberto, 2013) and, more importantly, increases GABAergic neurotransmission - either directly or indirectly (Lovinger & Roberto, 2013; Vengeliene et al., 2008). Since GABA-related inhibition is fundamental for motor control (Matsumura et al., 1992) and motor learning (Ziemann et al., 2001), this suggests that alcohol might have a strong influence on these brain functions. One non-invasive method to study excitability and GABA-related inhibition parameters is transcranial magnetic stimulation (TMS; Di Lazzaro & Ziemann, 2013; Kujirai et al., 1993). Surprisingly, however, and despite the wide use of this method in the field of motor control and motor learning (Ljubisavljevic, 2006), only few studies have investigated the acute effects of alcohol on corticospinal parameters using TMS (Turco et al., 2020). Moreover, some of these studies included only a small number of participants and/or did not have a control group. Therefore, the aim of this study was to investigate the acute effects of moderate alcohol consumption on excitability and inhibition parameters measured by TMS.

Methods: 24 participants were included in this randomized, single-blind, placebo-controlled study. Each participant was allocated to either the *alcohol* or the *placebo group*. Participants of the *alcohol group* received alcoholic drinks in order to reach a blood alcohol concentration of 0.6 ‰, while participants of the *placebo group* received similar drinks but without alcohol. Before (PRE) and after (POST) the drinks, TMS was applied on M1 to elicit motor evoked potentials in the flexor carpi radialis muscle. The following TMS parameters were assessed: (i) resting and active motor thresholds (rMT and aMT, respectively); (ii) corticospinal excitability (CSE), measured at rest, during an isometric contraction and during a precision task; (iii) cortical silent period (CSP), measured during an isometric contraction; (iv) short-interval intracortical inhibition (SICI), assessed using 1 ms (SICI-1) and 3 ms (SICI-3) interstimulus intervals, and measured at rest as well as during a precision task. Data were analyzed using two-way mixed model 2x2 ANOVAs (*GROUP* (*alcohol, placebo*) x *TIME* (*PRE, POST*)).

Results: Alcohol significantly reduced CSE measured during the precision task (significant interaction effect of *TIME x GROUP*: $F_{(1, 22)} = 8.645$, $p = 0.008$, $\eta^2_p = 0.282$). A trend towards reduced CSE was also observed during the isometric contraction (interaction of *TIME x GROUP*: $F_{(1, 22)} = 2.119$, $p = 0.160$, $\eta^2_p = 0.089$), while no differences were found at rest. Furthermore, we found a trend towards a reduction of SICI-1 by alcohol, both at rest (interaction effect of *TIME x GROUP*: $F_{(1, 21)} = 2.971$, $p = 0.099$, $\eta^2_p = 0.124$) and during the precision task (interaction effect of *TIME x GROUP*: $F_{(1, 22)} = 2.165$, $p = 0.156$, $\eta^2_p = 0.093$). No significant alcohol-related effects were found for SICI-3, rMT, aMT and CSP duration. For the latter two, however, main effects of *TIME* were observed, indicating a higher aMT ($F_{(1, 21)} = 4.496$, $p = 0.045$, $\eta^2_p = 0.17$) and a longer CSP ($F_{(1, 22)} = 4.494$, $p = 0.046$, $\eta^2_p = 0.17$) after alcohol consumption.

Discussion/Conclusion: In summary, we observed a decreased excitability during a precision task as well as a trend towards an increased SICI-1 after alcohol intake. It was previously demonstrated that, at concentrations commonly reached during normal social drinking situations, ethanol mainly acts on extrasynaptic $GABA_A$ receptors (Wallner et al., 2003). The extrasynaptic GABA system being

not the principal modulator of the CSE (Di Lazzaro & Ziemann, 2013), alcohol had no inhibitory influence on it at rest, as well as a weak (if any) effect during the isometric contraction, which is in line with the findings of Ziemann and colleagues (1995). However, the CSE was reduced after alcohol consumption during the precision task. It is known that extrasynaptic $GABA_A$ receptors are responsible for the generation of a tonic (as opposed to phasic) inhibition within the brain (Farrant & Nusser, 2005), which seems to play a role for motor coordination (Hanchar et al., 2005). Therefore, the precision task being coordinatively more challenging and requiring a fine-tuned inhibition (Matsumura et al., 1992), might have been more sensitive to the changes in tonic inhibition induced by alcohol. No effects of alcohol on SICI-3 were observed in this study, which is in contrast with the results of Ziemann et al. (1995). Again, alcohol at moderate concentrations potentially affects more extrasynaptic $GABA_A$ receptors, and these latter are not the main contributors to SICI-3 (Di Lazzaro & Ziemann, 2013). Together, this could explain the lack of influence of alcohol on this parameter. In contrast to SICI-3, a trend towards an inhibitory effect of alcohol on SICI-1 was observed. While the precise physiological mechanisms behind this TMS parameter are still unclear, it has been speculated that SICI-1 could reflect the extrasynaptic GABA tone (Stagg et al., 2011). The extrasynaptic GABA tone having potentially been enhanced by alcohol might explain the enhanced SICI-1 observed within the alcohol group. Finally, because an increase in the aMT was observed within both groups, it is most likely not related to the intake of alcohol but rather the result of a habituation effect. As a consequence, intensities used for the stimulations at POST were slightly higher compared to PRE. Together with the fact that the CSP duration changed in both groups and is depending on stimulation intensity (Säisänen et al., 2008), it might be assumed that changes in CSP were most likely no indicator for changes in $GABA_B$ inhibition but rather related to the increase in stimulation intensity.

In conclusion, increases in inhibition due to alcohol intake could be observed in motor cortical circuits. More specifically, a decrease in corticospinal excitability was found during the execution of a precision task as well as a trend towards an increase in SICI-1. However, as not all TMS parameters were affected by alcohol it might be assumed that at moderate concentration levels, alcohol affects motor cortical circuits mainly through the extrasynaptic GABA system.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Can rapid magnetic stimulation of the phrenic nerves continuously ventilate healthy humans without the development of diaphragm fatigue and intolerable adverse sensory responses over time?

Authors:

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Abstract:

Introduction: The ability of the diaphragm to produce pressure and flow is of utmost importance. Diaphragm function can be compromised by a number of mechanisms including the development of diaphragm fatigue during exercise, by muscle weakness due to cardiorespiratory disease, and even atrophy from chronic disuse in the ICU.
The functional evaluation and training of the diaphragm is difficult due to its location and the rarity of volitional diaphragm contractions in daily life. A common technique for evaluation of diaphragm function is phrenic nerve stimulation via single or double pulses while measuring the pressure generated. The emergence of rapid magnetic stimulation (RMS) now allows the exploration of muscle function during a tetanic contraction rather than a single twitch, which has a plethora of potential uses, for instance, training of the muscle to attenuate atrophy as shown in mechanically ventilated animals.[1, 2] However, it remains unknown if a continuous sequence of RMS can by itself fatigue the muscle, and whether this technique is tolerable for humans over a period of time. For this reason, we aimed to ventilate healthy subjects via this technique for 10 continuous minutes while assessing flow, trans diaphragmatic pressure and different subjective variables.
Methods: Eleven healthy participants (27±5years) of both sexes underwent 1-s bilateral RMS of the phrenic nerves with two D-shaped coils. Flow was measured via a pneumotachograph. Stimulation frequency and intensity were set to the combination that showed the highest tidal volume during a 1-s stimulation (20-30 Hz, 20-40% stimulator output), while respiratory frequency was set to match spontaneous ventilation (adapted by a decrease in stimulator output and increase in inspiratory duration up to 1.3 s in case initial settings were not well tolerated). A total of ten 1-min series of RMS-induced inspirations (passive expirations) were performed with brief interruptions to measure participant's perception of pain, discomfort and air hunger with a 0-10 visual scale. A subset of participants (n=6) were equipped with two balloon catheters to measure trans diaphragmatic pressure (Pdi). Tension-time index of the diaphragm (TTIdi) was calculated (established critical value for diaphragm fatigue is TTIdi=0.15, with higher values representing unsustainable muscle contractions). Diaphragm fatigue was defined as a decrease in minute ventilation ($\dot{V}E$) or Pdi over time.
Results: Nine participants completed 10 min, 1 participant was only able to reach 6 min due to discomfort and in 1 participant, no continuous ventilation could be achieved, likely due to upper airway closure. Participants showed a hyperventilatory response with a mean $\dot{V}E$ of 15.7± 4.6 L/min and PETCO2 of 33.9±5.0 mmHg. $\dot{V}E$ did not significantly decrease over time (p=0.156). Mean Pdi was 7.4±3.3 cmH2O TTIdi was 0.02±0.01, with neither value decreasing over time (both p>0.05). Average pain, discomfort, paresthesia and air hunger were rated as 1.2±1.1, 2.5±1.5. 1.8±1.7 and 1.1±1.7 points, respectively, and did not significantly change during the 10 min (all p>0.38).
Discussion/Conclusion: A 10-min series of RMS of the phrenic nerves is able to sufficiently ventilate the majority of healthy humans without development of diaphragm fatigue and without intolerable sensory consequences. Thus, testing for longer durations and the applicability in ICU-environments should be further explored.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Modulation of torque induced by wide-pulse, high-frequency neuromuscular electrical stimulation: implication of persistent inward currents?

Authors:

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Abstract:

Introduction:

Neuromuscular electrical stimulation (NMES) consists of the application of a series of intermittent stimuli to superficial skeletal muscles, in order to induce visible muscle contractions by activating the intramuscular nerve branches (Maffiuletti, 2010). NMES is used in athletes to enhance muscle strength and in patients to preserve/recover muscle mass and function in case of immobilization or disuse (Gibson et al., 1988). However, the discomfort associated with high stimulation intensity is a main limitation for its use (Delitto et al., 1992). As high evoked torque levels are related to strength gains (Maffiuletti et al. 2018), the application of NMES in frail populations is therefore limited. Recently, a new NMES modality characterized by long pulse durations (1 ms) delivered at high stimulation frequencies (100 Hz) was proposed to circumvent this limitation. This new modality called wide-pulse high-frequency NMES (WPHF NMES) favors reflexive recruitment of motor units at the spinal cord level by the depolarization of large sensory diameter afferents at low stimulation intensity. WPHF NMES has been observed to evoke a progressive increase in torque during the course of the stimulation ('extra torque') which occurs in ~60% of individuals, who are considered as "responders" (Wegrzyk et al., 2015). However, the mechanisms responsible for extra torque production remain largely unknown. The main hypothesis is the potential contribution of persistent inward currents (PICs), which are depolarizing currents caused by voltage-sensitive calcium and sodium channels mostly located on the motoneurons dendrites, which can amplify motoneuronal synaptic inputs (Heckman & Enoka, 2012). Similarities between PIC development and extra torque in response to WPHF NMES support the hypothesis of a link between the two mechanisms. Thus, any intervention aiming at modulating extra torque production in response to WPHF NMES should also modulate PIC strength. We have recently shown that a 15 min period of transcutaneous electrical nerve stimulation (TENS) impaired torque production in response to WPHF NMES, presumably through reduced PICs (Donnelly et al., 2021). Strategies aiming at enhancing the evoked torque production would be highly beneficial for rehabilitation purposes. PIC amplitude has been shown to be directly proportional to the level of monoaminergic input from the brainstem (Johnson et al., 2017). As serotonin projections to the spinal cord are very widespread, an increase in motor activity of a muscle ('remote contraction') should facilitate the contraction of a remote unrelated muscle and possibly increase the extra torque in response to WPHF NMES. The purpose of the present study was to test the hypothesis that a remote contraction would increase extra torque during WPHF NMES and that this increase would be due to enhanced PIC strength.

Methods:

Twenty-five healthy volunteers (7 women: mean ± SD, 23 ± 2 years, 61 ± 4 kg, 170 ± 7 cm and 18 men: 28 ± 6 years, 73 ± 4 kg, 181 ± 5 cm) took part to the experiments. They reported to the laboratory for one familiarization session and one experimental session. After maximal voluntary contraction (MVC) torque determination, the experiment was separated into three conditions: two control conditions without any intervention (Control 1, Control 2) and one 'remote' condition, i.e. the measurements were performed while the participants sustained an isometric elbow flexion at 20% of maximal voluntary torque. The three conditions were performed in the same order for all participants. Participants were first asked to perform an isometric triangular contraction with their plantar flexors (0 to 20% of MVC in 10 s and 20 to 0% MVC in 10 s). The intensity of stimulation necessary to evoke 10% of MVC torque using WPHF MNES (1 ms, 100 Hz) was then determined with 1-s stimulation trains and then, trains of 20s of WPHF NMES were delivered at this intensity. High-density electromyography (HD EMG) of the gastrocnemius medialis and the soleus muscles was

recorded using two 32 electrode grids. Intraclass correlation coefficients (ICC) were calculated to test reliability between Control 1 and Control 2 conditions and the average of both control conditions (Mean control) was further used since all ICC were considered "good" or "excellent" (Koo & Li, 2016).

Extra torque modulation: Extra torque was calculated as variation (%) between the final (last s) and the initial (first s) torque. Participants with a positive extra torque value were considered as "responders". Mean torque was calculated as the mean of the torque production during the 20 s of stimulation. All torques are expressed in % MVC torque.

Estimate of persistent inward currents: Surface EMG signals were decomposed into single motor unit discharge events with an algorithm using the convolutive kernel compensation method of separation with DEMUSE software (Holobar & Zazula, 2007). The decomposed signal was then edited manually to discard merged MU and erroneous firing patterns. Discharge events were converted into instantaneous discharge rates and fitted into a 5th-order polynomial function. Then, the change in discharge rate of a lower-threshold (control) motor unit from the moment of recruitment to the moment of de-recruitment of a higher-threshold (test) unit (ΔF) was calculated (Gorassini et al., 2002); ΔF has been shown to be proportional to PIC amplitude (Powers et al., 2008; Powers & Heckman, 2015). ΔFs were calculated for pairs of motor units with a rate-rate correlation equal to or above 0.7, with the test unit recruited at least 0.5 s after the control unit and when no saturation of discharge rates was detected on the control unit and they were averaged per participants. Data following a normal distribution were analyzed using Student's T-tests and Wilcoxon Rank's tests were used for data not normally distributed. Statistical significance was set at $p < 0.05$. Spearman's rank correlation coefficients were calculated between ΔF and extra torque parameters.

Results:

Extra torque modulation: Extra torque was lower in Mean control compared to Remote (median ± SD: +14.9 ± 113.1 and +54.8 ± 179.6% respectively, $p = 0.003$). Mean torque was not significantly different between Mean control and Remote (median ± SD: 6.5 ± 17.1 and 7.1 ± 15.0% MVC torque respectively, $p = 0.14$). The percentage of responders increased from 60 (Mean control) to 80% (Remote) of the sample size.

Persistent inward currents: ΔF was not different between Mean Control and Remote for *soleus* (mean: 1.40 ± 1.39 vs. 0.74 ± 1.90 Hz respectively, $p = 0.278$) and for *gastrocnemius medialis* (mean: 1.12 ± 1.34 vs. 0.96 ± 2.47 Hz respectively, $p = 0.721$). No correlation was found between ΔF and extra torque.

Discussion/Conclusion: Our results show that WPHF NMES extra torque can be enhanced by a remote contraction and that the occurrence of responders can be increased, which supports the central contribution to evoked torque during WPHF NMES. However, contrarily to expectations, our results do not support a direct link between PIC estimates and extra torque in response to WPHF NMES, as ΔF values were not modified by the remote contraction. Collectively, these findings give new perspectives for the use of WPHF NMES in training or rehabilitation, although the physiological mechanisms remain to be determined.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Oral Session

Wednesday 09.02.2022

15:50 – 17:10

Room 2420 **Physical Activity & Pathological Condition**
Chair: V. Gremeaux

High-intensity interval training improves microvascular endothelial function in hypertensive patients
L. Streese

Non-alcoholic fatty liver disease: Prevalence and all-cause mortality according to sedentary behaviour and a novel metric of physical activity tracking (Personal Activity Intelligence, PAI)
I. Croci

Fostering physical activity-related health competence after bariatric surgery with a multimodal exercise programme: A randomised controlled trial
J. Schmid

Effects of cancer-induced immobility on survival, muscle mass and function, and tumor growth
D. Neyroud

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

High-intensity interval training improves microvascular endothelial function in hypertensive patients.

Authors:

Streese L[1], Twerenbold S[1], Gander J[1], Carrard J[1], Hauser C[1], Schmidt-Trucksäss A.[1], Hanssen H[1].

[1]Department of Sport, Exercise and Health, Medical Faculty, University of Basel, Basel, Switzerland

Abstract:

Introduction: Hypertension is a global health care burden that affects the structure and function of the macro- and microcirculation and induces disease-specific end-organ damage. Vascular biomarkers are essential to timely diagnose this end-organ damage to improve cardiovascular (CV) risk stratification and medical decision making. Exercise therapy is an effective means to improve vascular health and reduce overall CV risk. However, it is still not clear whether high-intensity interval training (HIIT) is recommendable for patients with hypertension to reduce blood pressure, increase cardiorespiratory fitness and ameliorate vascular health. Therefore, this study aimed to investigate the reversibility of retinal end-organ damage by assessing the effects of an eight-week supervised and walking based HIIT on blood pressure, cardiorespiratory fitness as well as microvascular function, compared to a control group following standard physical activity recommendations.

Methods: Forty hypertensive patients, previously diagnosed with hypertension and treated for arterial hypertension with controlled blood pressure, were randomized to a walking based and supervised HIIT group (3x/week) or a control group (CG) following standard physical activity recommendations for eight weeks. Microvascular function was the primary outcome of this study. Microvascular function was assessed by investigating the arteriolar (aFID) and venular flicker-light induced dilatation response (vFID), previously highlighted as sensitive and non-invasive biomarkers to quantify microvascular endothelial function. Secondary outcomes were blood pressure, peak oxygen uptake, classical cardiovascular risk markers and further patients' characteristics.

Results: No adverse events occurred during the study period. Results of 19 hypertensive patients in the intervention (mean age 56±6 years) and 19 in the control group (mean age 60±7 years) were analysed. Both groups showed reduced body mass (HIIT: pre: 77.7±18.0 kg, post: 76.0±17.3kg, p=0.003; CG: pre: 77.0±14.0 kg, post: 72.1±13.4 kg, p=0.041) and body mass index (HIIT: pre: 25.8±3.1 kg/m2, post: 25.3±3.0 kg/m2, p=0.002; CG: pre: 25.2±3.0 kg/m2, post: 24.0±3.0 kg/m2, p=0.032) after the intervention period. Only the HIIT group reduced fat mass (HIIT: pre:27.2±5.5 %, post: 25.8±6.1 %, p=0.027; CG: pre: 27.2±6.8 %, post: 29.2±8.6 %, p=0.348) and increased peak oxygen uptake (HIIT: pre: 33.3±5.7 ml/min/kg, post: 36.7±5.1 ml/min/kg, p<0.001; CG: pre: 33.9±9.3 ml/min/kg, post: 33.9±11.4 ml/min/kg, p=0.620). Both groups showed no change in 24h or ambulatory blood pressure. aFID increased in the HIIT group (pre: 2.3±1.0 %, post: 3.2±1.3 %,p<0.001) but not in the control group (pre: 3.2±1.4 %, post: 2.7±1.5 %, p=0.805). aFID improvements were still statistically significant after correcting for Δblood pressure and Δpeakoxygen uptake. vFID showed no statistically significant changes either in the intervention nor in the control group.

Discussion/Conclusion: HIIT is a suitable exercise therapy to improve retinal microvascular endothelial function as a surrogate marker of cerebrovascular health in hypertensive patients independent of blood pressure changes. aFID is a sensitive vascular biomarker to quantify vascular improvements even after a short time period of 8 weeks. We would like to recommend to analyse retinal microvascular function beside classical CV risk factors like blood pressure, to distinguish responder and non-responder. Timely quantification of non-responder could lead to therapy adaptations in a personalized medicine approach.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Non-alcoholic fatty liver disease: Prevalence and all-cause mortality according to sedentary behaviour and a novel metric of physical activity tracking (Personal Activity Intelligence, PAI).

Authors:

Ilaria Croci[1,2,3], Jeff S Coombes[3], Silvana Bucher Sandbakk[2], Shelley E Keating[3], Arno Schmidt-Trucksäss[1], Javaid Nauman[2], Graeme A Macdonald[4], and Ulrik Wisloff [2,3]

[1]Division of Sports and Exercise Medicine, Department of Sport, Exercise and Health, University of Basel, Basel, Switzerland; [2]K.G. Jebsen Center of Exercise in Medicine, Department of Circulation and Medical Imaging, Norwegian University of Science and Technology, Trondheim, Norway;
[3] School of Human Movement and Nutrition Sciences, University of Queensland, Brisbane, Australia;[4]Department of Gastroenterology and Hepatology; PA Hospital; Brisbane, Australia.

Abstract:

Background: In individuals with low to moderate cardiorespiratory fitness (CRF), prolonged sedentary time (ST) is associated with non-alcoholic fatty liver disease (NAFLD) prevalence and mortality (Croci et al., 2019). A novel metric for physical activity (PA) tracking named Personal Activity Intelligence (PAI) has recently been developed. A PAI score of ≥100: i) is associated with appropriate age-specific levels of CRF, ii) attenuates the negative association between ST and CVD risk, and iii) is associated with lower mortality (independent of meeting current PA recommendations) in the general population. However, whether achieving ≥100 PAI has a similar protective effect on hepatic health, and on mortality in patients with NAFLD, is not known.

Methods: A cross-sectional analysis of 15,781 adults (52% female; age range 19-95 years) was conducted. Self-reported ST (average h/d) were divided into sex-specific tertiles. Weekly PAI scores were calculated from age, sex, resting heart rate (HR) and predicted HRmax using a published algorithm. NAFLD status was estimated using the validated Fatty Liver Index (FLI). Adjusted odds ratios (OR) and 95% confidence intervals (CI) were estimated using logistic regression analyses. Hazard Ratios for all-cause mortality were estimated using Cox proportional hazard regression in individuals with NAFLD.

Results: The likelihood of having NAFLD was 77% higher (OR,1.77, CI,1.46-2.14) in sedentary individuals (ST>7h/d) not achieving ≥100 PAI, compared to the reference group (≥100PAI and ST<4h/d). Sedentary individuals (ST>7h/d) who managed to achieve ≥100 PAI were protected (OR,1.17; CI,0.95-1.45). Survival analyses revealed that over 9.4±1.3 years of follow-up, individuals with NAFLD and PAI ≥100, had the risk of mortality significantly decreased compared to those who were inactive, independent of ST.

Conclusion/discussion: Achieving a score of ≥100 PAI weekly attenuates the adverse effects of ST on NAFLD prevalence; and is associated with lower mortality within patients with NAFLD. Monitoring PAI could be a useful novel strategy to protect against NAFLD and prolongue life in individuals with NAFLD.

References:

Croci, I., Coombes, J. S., Bucher Sandbakk, S., Keating, S. E., Nauman, J., Macdonald, G. A., & Wisloff, U. (2019). Non-alcoholic fatty liver disease: Prevalence and all-cause mortality according to sedentary behaviour and cardiorespiratory fitness. The HUNT Study. *Progress in Cardiovascular Diseases, 62*(2), 127-134. doi:10.1016/j.pcad.2019.01.005

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Fostering physical activity-related health competence after bariatric surgery with a multimodal exercise programme: A randomised controlled trial

Authors:

Schmid J[1], Schorno N[1], Herzig D[2], Bally L[2].

[1] Institute of Sport Science, University of Bern, Switzerland

[2] Department of Diabetes, Endocrinology, Nutritional Medicine and Metabolism, Inselspital, Bern University Hospital, University of Bern, Switzerland

Abstract:

Introduction: Regular physical activity supports the long-term success of bariatric surgery by positively influencing weight maintenance, cardiovascular risk, bone health and wellbeing (e.g., Josbeno et al., 2010). However, integrating health-enhancing physical activity in daily life requires specific competences (Sudeck & Pfeifer, 2016). In this study, we evaluated a multimodal exercise programme to build these competences.

Methods: Forty adults who underwent bariatric surgery within the past 3-10 months were randomized to a multimodal exercise programme (n = 20) or control group (n = 20). The three-month exercise programme comprised (a) group exercise trainings, (b) educational group workshops and (c) an individual exercise counselling in addition to usual post-operative care. Primary outcomes were the four facets of physical activity-related health competences, namely the control competence for physical training, physical activity-specific affect regulation, motivational competence and physical activity-specific self-control measured as continuous scores. Secondary outcomes were physical activity behaviour and subjective vitality as an indicator of wellbeing. Outcomes were assessed before (t1), directly after completion of the intervention (t2) and at three months follow-up (t3) and compared between the groups using generalized estimating equations.

Results: Significant treatment effects were found for control competence for physical training (t1-t2: b = 0.62; 95% CI [0.16, 1.08]; t1-t3: b = 0.76; 95% CI [0.37, 1.16]), physical activity-specific self-control (t1-t2: b = 0.58; 95% CI [0.04, 1.00]) but not for physical activity-specific affect regulation and motivational competence. Significant treatment effects were further observed for self-reported exercise (t1-t2: b = 1.57; 95% CI [0.98, 2.16]; t1-t3: b = 1.10; 95% CI [0.31, 1.89]) and subjective vitality (t1-t3: b = 1.03; 95% CI [0.32, 1.75]), all in favour of the intervention. In contrast, no treatment effect was found for accelerometer-based moderate to vigorous physical activity.

Discussion/Conclusion: A short-term targeted multimodal exercise intervention was effective in improving single facets of physical activity-related health competence and in promoting self-reported exercise behaviour and wellbeing among bariatric surgery patients.

References:

Josbeno, D. A., Jakicic, J. M., Hergenroeder, A. & Eid G. M. (2010). Physical activity and physical function changes in obese individuals after gastric bypass surgery. *Surg Obes Relat Dis*, 6, 361–6. doi:10.1016/j.soard.2008.08.003.

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SPORTWISSENSCHAFTLICHE
SOCIETE SUISSE DES
GESELLSCHAFT DER SCHWEIZ
SCIENCES DU SPORT

Title:

Effects of cancer-induced immobility on survival, muscle mass and function, and tumor growth

Authors:

Neyroud D.[1],[2], Lamm JH.[2], Callaway CS.[2], Judge SM.[2], Judge AR.[2] & D'Lugos AC.[2]
[1]Institute of Sport Sciences, University of Lausanne, Switzerland
[2]Department of Physical Therapy, University of Florida, USA

Abstract:

Introduction: As a consequence of cancer, up to 80% of patients develop cachexia defined as an ongoing loss of muscle mass that associates with muscle weakness and functional impairments. Noteworthy, the degree of cancer cachexia has been shown to correlate with the degree of mobility (Fouladiun et al., 2007). While no therapeutic treatments are currently approved to prevent or counter cancer cachexia, physical activity appears as an interesting option. Here, we hypothesized that cancer leads to impaired mobility contributing to cancer-associated muscle wasting and dysfunction.

Methods: Aged (21months),male C57BL/6J mice were randomly assigned to one of the following groups: (i) sedentary non-tumor-bearing (Sed-Sham), (ii) sedentary tumor-bearing (Sed-KPC), physically active non-tumor-bearing (PA-Sham) and physically active tumor-bearing (PA-KPC).All mice were individually housed in cages equipped with infrared monitors (to assess cage activity) and running-wheels, which remained either locked for Sed mice or unlocked for PA mice. Mice were orthotopically inoculated with either 50 µl of sterile phosphate-buffered saline (PBS, i.e. Sham groups) or 2.5 x 105murine pancreatic cancer cells (KPC FC1245) diluted in 50 µl of PBS (i.e. KPC groups). Grip strength was evaluated prior to inoculation, 7 days (D7), 10 days (D10) and 14 days (D14, i.e. humane endpoint)post cell inoculation. Skeletal muscles were harvested and processed for immunohistochemistry and gene expression analyses.

Results: Sed-KPC mice reached humane endpoint 14 days post inoculation and showed a 50% reduction in their total daily cage activity, which trended towards statistical significance ($p < 0.1$). No reduction in cage activity was observed in PA-KPC mice ($p > 0.05$), despite PA-Sham mice showing a 3-fold greater cage activity than Sed-Sham ($p < 0.05$). At D14, Sed-KPC mice presented a 33% reduction in grip strength relative to pre-inoculation ($p < 0.05$), while no such reductions were observed in Sed-Sham, PA-Sham or PA-KPC mice. At the time of sacrifice, Sed-KPC mice showed a 9% reduction in body mass that associated with a reduction of 11% in both tibialis anterior and gastrocnemius-plantaris muscle masses ($p < 0.05$). In contrast, no reduction in muscle masses was observed in PA-KPC mice ($p > 0.05$). Similarly, PA also protected against KPC-induced soleus fiber atrophy –i.e. the 17% reduction in fiber size observed in Sed-KPC vs. Sed-Sham ($p < 0.05$) was fully prevented by PA (i.e. +2% in PA-KPC vs. PA-Sham mice, $p > 0.05$). To note, Sed-KPC mice presented with on average a 1.3 g tumor mass 14 days post inoculation, while tumors were 2.8-fold smaller in PA-KPC mice (i.e. 0.47 g, $p < 0.05$). At the time when Sed-KPC mice reached humane endpoint, PA-KPC mice were still in a good general body condition suggesting that PA may extend survival. The extent to which PA can prolong survival of KPC mice is currently being investigated.

Discussion/Conclusion: The present study demonstrates that PA, via wheel-running, is an effective method to counter cancer-induced reductions in mobility. Moreover, wheel running prevented cancer-associated muscle wasting and dysfunction, and slowed tumor growth.

References:

Fouladiun, M., Korner, U., Gunnebo, L., Sixt-Ammilon, P., Bosaeus, I., & Lundholm, K. (2007). Clin Cancer Res, 13(21), 6379-6385. doi:10.1158/1078-0432.CCR-07-1147

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Oral Session

Thursday 10.02.2022

14:30 – 15:50

Room 2218 **Various Approaches in Physiology**
Chair: N. Place

Successful return to performance after COVID-19 infection: a case report
C. Besson

HRV phenotypes in elite sports - insights from a two-year follow-up in elite sports
N. Bourdillon

Does the Wim Hof Breathing Method improve repeated sprint performance?
T. Citherlet

Physical activity and cardiorespiratory fitness as moderators of the relationship between post-traumatic stress disorder symptoms and physical/mental health outcomes among individuals living in a Greek refugee camp
M. Gerber

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Successful return to performance after COVID-19 infection: a case report

Authors:

Besson, C.[1,2], Guex, K.[3,4], Schmitt, L.[5], Gojanovic, G.[6,7], Gremeaux, V.[1,2]

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[7] SportAdo Consultation, Interdisciplinary Division for Adolescent Health (DISA), Department of Women-Mother-Child, Lausanne University Hospital, Lausanne, Switzerland

Abstract:

Introduction: Fatigue may be related to infections, and COVID-19 may have severe medical consequences for athletes (e.g. myocarditis). The sports medicine staff thus needs to follow the latest guidelines to manage infected athletes and their return to training whilst minimizing negative health and performance outcomes. Recently, heart rate variability (HRV) was cited as a useful indicator for COVID-19 onset and early detection. Considering limited knowledge available on return to sport post-COVID-19, this case report highlights synergistic training load and HRV monitoring values, in addition to medical follow-up, in a COVID-19 infected elite track and field sprinter who moved successfully through the different return to sport phases.

Methods: Training load, subjective morning fatigue (MF) and supine HRV were monitored 5 weeks before infection until 7 weeks post-infection. Training load was calculated in arbitrary units (a.u.), as session duration times (min) multiplied by rate of perceived exertion (RPE 1-10). Subjective morning fatigue (MF) was collected using a 0-10 Likert-like scale. HRV was collected using a heart rate monitor (InONE, Be.Care, Switzerland) and a smartphone app (inCORPUS, Be.Care, Switzerland). Parasympathetic time- and frequency domain variables (mean HR, root mean square successive differences (RMSSD), high frequency power (HF) relative to HR (HF/HR)) were kept for analysis. Analysis were performed with Kubios Premium 3.4.0

Results: During a high training load period (training camp), MF and heart rate (HR) increased and RMSSD and HF/HR decreased. MF increased and stayed high 3 days after the camp despite decrease in training load. In contrast, 4 days after the camp, HR decreased and RMSSD and HF/HR increased, reflecting parasympathetic hyperactivity. Elevated MF and suboptimal training performance led to COVID-19 test decision, which returned positive. After a 10-day training suspension, training load was progressively increased with low MF and high vagal tone responses, interpreted as positive adaptations to training load. The athlete was able to return to competition 17 days after medical clearance for return to participation and beat one week later his indoor 60-m personal best.

Discussion/Conclusion:

In this athlete, COVID-19 infection induced parasympathetic hyperactivity with subjective fatigue. This case report presents how performance capacity was only short-termed negatively influenced by a COVID-19 infection with a quick and successful return to performance, thanks to a state-of-the-art medical management. It also highlights the importance of TL and HRV monitoring alongside subjective fatigue in return to sport decisions.

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

HRV phenotypes in elite sports - insights from a two-year follow-up in elite sports

Authors:

Bourdillon N[1,2], Yazdani S[1], Millet GP[2]

[1] be.care SA, Chemin du Closel 5, 1020 Renens Switzerland.

[2] ISSUL, University of Lausanne, Lausanne Switzerland.

Abstract:

Introduction: Hear rate variability (HRV) follow-up is paramount in elite sports both for training, performance, and general health. Past publications showed that HRV-guided training is beneficial for elite performance in endurance sports. However, HRV is also used in non-endurance sports such as team sports or sprint, gymnastics and shooting for example. HRV comparison between sports is essential for a better understanding of the various phenotypes induced by training.

Methods: 10,627 orthostatic tests (5 minutes supine and 5 minutes standing) were performed by 430 elite athletes using a chest strap heart rate monitor and the inCORPUS® mobile application to record RR data. Mean HR, root mean square of the successive differences (RMSSD), power in the low frequency band (LF) and the high frequency band (HF) were computed separately in each position. Elite athletes in endurance sports (road cycling, athletic endurance (5,000m, 10,000m, marathon and race walking), and mountain biking), team sports (football, rugby, and basketball) and other sports (athletic sprint, kayak, shooting and gymnastics) participated in this study.

Results: As expected supine HR was lower in the endurance group compared to the other groups while RMSSD and HF were higher, except for athletic sprint. In the standing position LF was higher in endurance athletics denoting a high capacity of activation while it was lower in the road cycling group. LF and HF were both high in the athletic endurance group denoting the needs for both a high vagal tone (correlated to the endurance training) and a high sympathetic tone necessary for the intense activation needed typically for the sprinting periods during the races or more specifically for 5,000- or 10,000-m runners.

Discussion/Conclusion: The classical assumption that endurance training has an effect only by increasing the parasympathetic activity is only partially supported by the present comparison of different sports. Performance may be associated to the appropriate development of a specific neurovegetative balance in each sport. Future study should focus on separating each sport to better characterize each phenotype.

SPORTWISSENSCHAFTLICHE
SOCIETE SUISSE DES
GESELLSCHAFT DER SCHWEIZ
SCIENCES DU SPORT

Title:

Does the Wim Hof Breathing Method improve repeated sprint performance? *

Authors:

Tom Citherlet [1]*, Fabienne Crettaz von Roten[1], Bengt Kayser [1] and Kenny Guex [2,3]

[1] Institute of Sport Sciences, University of Lausanne, Lausanne, Switzerland

[2] School of Health Sciences, University of Applied Sciences and Arts Western Switzerland, Lausanne, Switzerland

[3] Swiss Athletics, Haus des Sports, Ittigen, Switzerland

Abstract:

Introduction:

The Wim Hof breathing method (WHBM) consists of periods of hyperventilation (HV) followed by voluntary breath-holds (BHs) at low lung volume. It has recently grown in popularity, including in the sport performance field. However, there is as yet no scientific evidence to support the use of this technique. Thus, the purpose of this study was to evaluate whether a single WHBM session can improve repeated sprint performance.

Methods: Fifteen amateur runners completed WHBM, voluntary HV and spontaneous breathing (SB) (control) trials in a randomized cross-over design on three separate occasions before performing the Repeated Ability Sprint Test (RAST). Gas exchange, heart rate, and finger pulse oxygen saturation (SpO2) were monitored throughout.

Results: Although HV and WHBM caused large fluctuations in SpO2 and exhaled carbon dioxide (VCO2), no significant positive or negative effects on RAST peak power, average power, or fatigue index were found. At the end of the BHs, SpO2 had dropped to 60 ± 12%. In the last HV under WHBM and HV conditions, the end-tidal CO2 partial pressure values were 19 ± 3 and 17 ± 3 mmHg, respectively, indicating respiratory alkalosis. The estimated arterial pH increases were +0.171 and +0.181, respectively. Upon completion of RAST, the accumulated VCO2 in the first 8-min of recovery in WHBM and HV were greater than in SB, indicating lingering depletion of carbon dioxide stores.

Discussion/Conclusion: These results demonstrate clear acute effects of the WHBM on physiological outcomes. However, these effects did not induce any advantages in repeated-sprint performance. Therefore, the enhancement of repeated sprinting performance with the use of this technique is not supported by this study.

* this study was recently
published: https://www.frontiersin.org/articles/10.3389/fspor.2021.700757/full

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Physical activity and cardiorespiratory fitness as moderators of the relationship between post-traumatic stress disorder symptoms and physical/mental health outcomes among individuals living in a Greek refugee camp.

Authors:

Gerber M[1], Colledge F[1], de Quervain D[2], Filippou K[3], Havas E[3], Knappe F[1], Ludyga S[1], Meier M[4], Morres ID[3], Pühse U[1], Seelig S[1], Theodorakis Y[3], von Känel R[5], Hatzigeorgiadis A[3]

[1]Department of Sport, Exercise and Health, University of Basel, Switzerland
[2]Division of Cognitive Neuroscience, University of Basel, Switzerland
[3]Department of Physical Education and Sport Sciences, University of Thessaly, Greece
[4]Interdisciplinary Center for Gender Studies, University of Bern, Switzerland
[5]Department of Consultation-Liaison Psychiatry and Psychosomatic Medicine, University Hospital Zurich, Switzerland

Abstract:

Introduction: During recent years, the number of individuals forced to flee their home countries has steadily increased due to ongoing political and social conflicts. During their flight, many refugees experience severe mental and physical strain and are exposed to potentially traumatic events. Moreover, many refugees are forced to live in a refugee camp for several years, where they are often confronted with future and existential fears due to their uncertain residence status. Not surprisingly, therefore, the risk of suffering from psychiatric disorders, including post-traumatic stress disorder (PTSD), is increased among international refugees compared to the general population. Given this background, we initiated the SALEEM project to examine the effects of a sport and exercise intervention among refugees living in a Greek refugee camp on PTSD symptoms (primary outcome) and a series of secondary outcomes including physical activity, cardiorespiratory fitness, depressive symptoms, health-related quality of life, cognitive function and cardiovascular risk. **Methods:** The SALEEM study is designed as a pragmatic randomized controlled trial with an intervention group and a wait-list control group, with a 1:1 allocation ratio between the two groups. In total, 136 participants were recruited (68 men, 68 women) from the "Koutsochero" refugee camp, situated in the municipality of Larissa. Most of them were from Syria, Afghanistan and Irak. As part of this paper, we will present data from the baseline data assessment to address the following two research questions: (a) What is the prevalence of PTSD symptoms among refugees living in a Greek refugee camp, and how does the prevalence depend on participants' socio-demographic background? (b) How are PTSD symptoms associated with other mental health outcomes, cognitive functioning and cardiovascular health risk markers, and is this relationship moderated by participants physical activity and cardiorespiratory fitness levels? **Results:** Baseline data assessment was carried out in May 2021. The intervention is currently implemented and follow-up data assessment will be complete in December 2021. Data processing and data analysis are currently underway. **Discussion/Conclusion:** In refugee camps, even the supply of basic necessities poses a challenge (Knappe, Colledge, & Gerber, 2019b). Implementing exercise and sport programs is, to a certain degree, of secondary importance. Our study has the potential to provide further evidence that the investment in physical activity is a worthwhile endeavor, which can potentially at times compensate for other difficulties inherent in camp life (Knappe, Colledge, & Gerber, 2019a).

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Knappe, F., Colledge, F., & Gerber, M. (2019a). Impact of an 8-week exercise and sport intervention on post-traumatic stress disorder symptoms, mental health, and physical fitness among male refugees living in a Greek refugee camp. International Journal of Environmental Research and Public Health, 16, doi: 10.3390/ijerph16203904.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Oral Session

Thursday 10.02.2022

14:30 – 15:50

Room 2420 **Sociology of Sport**

Chair: S. Nagel

The role of team structures for social integration in Swiss football clubs
M. Buser

Gender regimes and fields of sports governance
M. Pape

Will self-tracking of physical activity disrupt insurance models? Analyzing daily technological enactments of solidarity
B. Presset

Patterns of sports-related and socio-economic resources at the end of the athletic career and their impact on the subsequent vocational career: A person-oriented analysis among former Olympic athletes
M. Schmid

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

The role of team structures for social integration in Swiss football clubs

Authors:
Buser M[1], Piller S[1], Nagel S[1].
[1]Institute of Sport Science, University of Bern, Switzerland

Abstract:

Introduction: Voluntary sport clubs (VSCs) are often considered as a clue of society. VSCs provide social encounters between people from different backgrounds and are a place for social integration, e.g. the establishment of belonging and identification. Yet, like other social settings, VSCs can also be a place of exclusion, where assimilative ideas and feelings of otherness are present. Both – mechanisms of social integration but also exclusion-might especially become visible in teams or training groups, where members meet on a regular basis. To explain social integration in VSCs, recent studies have followed a multilevel perspective, assuming that social integration of club members not only depends on individual characteristics, but also the opportunity structures at the club level (e.g. Elmose-Østerlund et al.,2019). Yet, these studies have missed so far to include the team level as a separate level of analysis, but called for the inclusion of the team as a structural context in future studies. Teams can be considered as relative stable social milieus within VSCs close to the members personal sphere, which most likely shape peoples opportunity structures (Esser, 1999).While teams as social groups can be expected to produce feelings of belonging from a theoretical perspective (Tyrell, 1984), qualitative research on belonging in sports (e.g. Burrmann et al., 2017) has especially highlighted the role of regular, positive social interactions, for example promoted through a pronounced sociability or a respectful cultural environment. Empirical studies that systematically consider the social context of the team together with individual and club structural factors are missing. Therefore, the following research question is addressed: What is the role of the team level for social integration of members in VSCs?

Methods: The empirical analyses utilize data from the cross-sectional study "Social integration in Swiss football clubs" conducted between 2019 and 2020 together with the Swiss football federation. The data contains observations on 1525football club members nested in 145 football teams, which are again nested in 42 Swiss voluntary football. Clubs were located in the German and French part of Switzerland and in different settlement structures. Within each club, club representatives selected 2-5 teams, which were visited by the research team before or after practice. Coaches completed a questionnaire on team structures (e.g. team goals, team culture) and present team members answered a questionnaire on individual characteristics, including individual social integration. The visited teams played in youth (44), active (84) and senior (13) competitions. The surveyed members were on average 24.6years old and member of the club for 8.8years. 208 members (13.7%) were female and 287 (19.3%) had a voluntary or full-time job in the club. 245 members (16.2%) were born outside of Switzerland. To analyze the role of the team level for social integration in VSCs, multilevel models were implemented. They allow considering the similarity of nested observations and testing variables at different levels at the same time. The depended variable social integration was conceptualized along the dimension of identification after Esser (2009), operationalized by four items based on the systematic measurement instrument of Adler Zwahlen et al. (2018) to analyze social integration in VSCs (Cronbachs alpha = .714). Following the relevance of positive social interactions for the development of feelings of belonging, variables at the team level were selected in the field of team sociability (e.g. sociability goal of the team, team events) and team culture and climate (e.g. respectful team culture). Most typical variables used in recent multilevel models on social integration were included as controls at the individual and club level.

Results: The analysis of the intraclass correlation coefficients (ICC, Hox, 2010) showed a small ICC of 3.5 percent at the club level and a medium to large ICC of 13.3 percent at the team level. This means that only a small portion of the total variance in the members identification is explained by differences between clubs, but a medium to large portion is explained by differences between teams. Therefore, the inclusion of the team level is justified from an empirical perspective and

team-structural variables can be explored to explain the differences in the identification of the members between the teams. Relevant structural variables were observed at the team level. Members in active and senior teams showed higher identification than members in junior teams. Yet, only the effect for active teams was significant. Regarding the sociability in the team, members in teams with a higher number of team events during the season (e.g. team dinners, team weekends) show higher identification with the club. A higher sociability goal in the team and a higher extend of sitting together after practices showed significant bivariate relationships with identification, but were not relevant under control for the number of team events. Regarding team culture and climate, members in teams with a higher social cohesion (scale of three items on team atmosphere, spirit and cohesion) show higher identification with the club, while an accepting team culture (scale of three items on a welcoming, respecting and accepting culture) only showed a significant bivariate relationship. At the individual level, women and higher educated showed significantly less identification with the club, while volunteering, a longer club and team membership duration and a higher frequency of activity in the club was connected to more identification. Club structures (club size, settlement structure, sociability goal, competition goal) did not show relevant correlations with identification.

Discussion/Conclusion: The innovative contribution of this analysis is the inclusion of the team level in a multilevel perspective on social integration in VSC. For the first time, Team structures of 145 football teams were considered in a three level multilevel model. The analysis showed that the social milieu of the team is relevant for social integration of members in VSCs. Teams seem to touch the social sphere of sport club members and shape their conditions for social integration, here for identification with the VSCs. The sociability in the form of team events and a strong social cohesion are likely to stimulate positive social interaction (Burrmann et al., 2017) and are relevant for identification of sport club members. Based on these findings, we can recommend that club and team representatives try to manage team structures in order to foster identification of club members and strengthen membership commitment. Yet, transfer needs to be done carefully. Caution is necessary regarding reverse causality and selection effects. For example, it is possible, that teams with higher club identification of the members rather implement team events and show higher team cohesion. Furthermore, this study focused on football clubs only. Even though the results seem plausible also for teams in other sport clubs, it remains to be analyzed how the results are stable for different club and team structures (sport discipline, team size).

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Gender Regimes and Fields of Sports Governance

Authors:

Madeleine Pape[1] and Lucie Schoch[1]

[1]Institute of Sports Sciences, University of Lausanne

Abstract:

Introduction: How can the governance of sport be conceptualized as gendered? To answer this question, we investigate the case of the International Cycling Union (UCI) and specifically the experiences of women in leadership positions. We suggest that the literature in sociology of sport and sports management to date that has engaged with questions of gender and leadership has typically focused on dynamics within a single organization, without considering its place within a broader field of governance. We propose instead to take Connell's (1987) concept of gender regimes—the state of play of gender relations within a given institution—and consider the workings of gender at the extra-organizational level. In other words, we place the UCI in its wider governance context to consider how the actions of this organization are shaped by other actors within a dynamic field of interests and power relations (Fligstein and McAdam 2015). In doing so, we propose to bring a gender perspective to work that conceptualizes sports governance as networked, but which has rarely attended to the constitutive role of gender relations.

Methods: This study relies on 21 semi-structured interviews, conducted with UCI employees (n=15) or individuals who have held a position within the governance structure of the UCI (n=6) between the years 2000–2020. These interviews were recorded, later transcribed, and then iteratively coded by the two researchers according to a range of emergent themes related to gender difference, governance structure, interests, power, and conflict.

Results: Whereas the sports management approach to governance tends to emphasize sports governing bodies' pursuit of autonomy, the horizontal and collaborative nature of relations amongst actors within the field, and the importance of relations with the state (see e.g., Geeraert Mrkonjic & Chappelet 2015), our focus on women leaders at the international level of cycling enables us to identify a different set of dynamics at work. First, at stake for the UCI is control rather than autonomy *per se*, including control over the race calendar vis-à-vis other actors within the field, as well as legitimacy, following the damage wrought by doping scandals. Second, these field relations are very often characterized by tension and conflict, rather than by collaboration, as exemplified by the struggle over French versus British leadership of the sport. Third, the state is implicated only marginally in the struggles taking place: much more critical to relations within the field are actors like the International Olympic Committee, race event organizers, confederations, and national federations. Critically, all these dimensions intersect with the dynamics of masculinity that are deeply embedded within the sport of cycling. As such, "gender equality" agendas must be carefully managed and navigated by actors within the field.

Discussion/Conclusion: Via this study, we argue that gender is not just shaped by the field of governance in which the UCI is located, but that it is also an organizing logic within the field itself. The UCI retains the capacity to act in ways that could meaningfully advance women leaders. However, the UCI's willingness to do so can only be understood by placing it within the broader context of conflictual relations of governance, within which masculine power is at stake.

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Title:

Will self-tracking of physical activity disrupt insurance models? Analyzing daily technological enactments of solidarity

Authors:

Presset B[1,2]

[1] Institute of sport sciences, Faculty of Social and Political Science, University of Lausanne, Switzerland

[2] Department of Technology and Society Studies, Faculty of Arts and Social Sciences, Maastricht University, The Netherlands

Abstract:

Introduction: The last decade has witnessed the implementation of the digital tracking of physical activities in insurance programs. Such programs rely on smartphone and smartwatch data to measure physical activity and distribute bonuses or reductions on insurance premiums. It has been argued that such programs challenge classical solidarity-based models of health insurance (Cevolini & Esposito, 2020). So far, this has mostly been analyzed from a theoretical standpoint and with a focus on legal and regulative frameworks (McFall, 2019). Subscribing to the concerns of practice theory (Schatzky, 2001), and drawing from work on techno-moral change (Swiestra, 2013) our aim is to tackle the issue empirically from the point of view of users. In other terms, we are interested to understand the specific role of self-tracking (as a technology) in mediating values such as solidarity and self-responsibility in daily practices. This is a crucial issue for a focus on regulative frameworks may blind us to societal changes that are taking place in supposedly mundane daily routines

Methods: The study relies on 43 interviews with users of a self-tracking program developed by a health insurance. Interviews were analyzed following the principles of grounded theory (Corbin & Strauss, 1990)

Results: Analysis of the technology reveals that its script tends to raise awareness of one's responsibility in lowering (or augmenting) health costs, while obscuring the role of social determinants, environment, and social rhythms. Thus, it fosters reductionist enactments of health and bodies in daily life. Consequently, it questions and disrupts users' understandings of solidarity and may lead to changes in their moral stances.

Discussion/Conclusion: Our results suggest that self-tracking in insurance – although currently challenged by regulative frameworks in most European countries – may lead to changes in citizen's understanding of solidarity. In societies which tend to abide to neoliberal tendencies, this may eventually lead to destabilizing the principle of solidarity and the current models of insurance.

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SPORTWISSENSCHAFTLICHE
SOCIETE SUISSE DES
GESELLSCHAFT DER SCHWEIZ
SCIENCES DU SPORT

Title:

Patterns of sports-related and socio-economic resources at the end of the athletic career and their impact on the subsequent vocational career: A person-oriented analysis among former Olympic athletes

Authors:

Michael J. Schmid, Merlin Örencik, Jürg Schmid, and Achim Conzelmann Institute of Sport Science, University of Bern, Switzerland

Abstract:

Introduction: Successful careers in high-performance sport require great investments over many years by the athletes. However, being an elite athlete is not a lifetime job. Indeed, the average age of athletic retirement is soon after 30 (e.g., in Switzerland at around 31 years; see Kuettel et al., 2017). As a result, a reorientation at a relatively young age is required. In general, it can be said that most athletes are able to successfully launch a vocational career. When studied differentially, there are nevertheless differences between the former athletes (Conzelmann & Nagel, 2003). While some athletes pursue a normal academic career alongside sports, others focus exclusively on sports and choose to stay in sports after the end of their athletic career, for example, as a coach. However, there are also athletes who have difficulties building a vocational career or are not satisfied with it. The question therefore arises how these different vocational careers originate. Hence, the aim of this study was to examine patterns of sports-related and socio-economic resources at the end of the athletic career and their impact on the subsequent vocational career.

Methods: Athletes were invited to this study if they participated in the Olympic Games for Switzerland between 1988 and 2012. A total of 638 individuals were contacted for the study, of which 341 participated (response rate 53.5%; 32.8% women, 67.2% men). There was no significant difference between respondents and non-respondents in terms of gender, year of birth, type of sports (i.e., summer/winter sports), success at the Olympics, and popularity. We surveyed the sample with an online questionnaire regarding their athletic, educational, and vocational career. In line with the person-oriented approach, we adopted a holistic perspective, allowing interactions between different aspects of an athlete's career, and considering former athletes as a heterogeneous group. More precisely, the LICUR (Linking of Clusters after removal of a Residue) method was applied to identify different developmental trajectories (see Bergman et al., 2003). This procedure included three steps: First an outlier analysis was conducted, whereby the squared average Euclidean distance of 0.8, calculated on standardized variables was used as a criterion to detect possible outliers. Second, hierarchical cluster analyses (Ward's method, average squared Euclidean distance) were carried out to find characteristic patterns of sports-related and socio-economic resources at the end of the athletic career on the one hand and characteristic patterns of vocational status on the other hand. We used the following six operating factors for the situation at the end of the athletic career: success in sports, popularity during the sports career, income during the sports career, highest educational qualification, average employment level during the two years before athletic retirement, parental socio-economic status. In order to characterize the vocational status five years after the end of the athletic career in sports, we used prestige, job autonomy and the vocational field as operating factors. Third, transition probabilities (i.e., OR) between the two cluster solutions at the two different development points were estimated.

Results: At the end of the athletic career, we identified six clusters of resources (i.e., 1: athletically successful, popular high earners; 2: athletically successful, popular academics; 3: successful athletes with little income and an average educational level; 4: less renowned athletes with excellent education and vocational experience; 5: work-experienced athletes with little education and a low parental socio-economic status; 6: less successful athletes with high parental socio-economic status). Five years after sports career termination we found five clusters of vocational status (i.e., 1: liberal professions or executive-level jobs outside of sports; 2: higher-level employees with high autonomy in sports; 3: mid-level employees with high autonomy outside of sports; 4: lower-level employees in sports; 5: skilled workers and lower grade white collar workers outside of sports). When linking the six resources clusters with the five vocational status clusters and calculating

transition probabilities, twelve distinct transition paths emerged. Thus, the different patterns of sports-related and socio-economic resources at the end of an athletic career influenced the probability of specific vocational careers. Specifically, it has been shown that individuals who had acquired many resources in one domain (e.g., popularity through sports) but had tended to neglect other areas (i.e., education, profession) were mostly full-time professional athletes. Athletes who had many resources in education, work, or family, but few in sports were more likely than other athletes to be employed in jobs outside of sports five years after their sports career.

Discussion/Conclusion: This study contributes to the discussion on career transitions out of high-performance sports (for an overview, see Park et al., 2013). Specifically, we examined patterns of sports-related and socio-economic resources at the end of the athletic career and their impact on the subsequent vocational career. While the existing literature often examined the influence of dual careers on the transition process (e.g., Barriopedro et al., 2018; Torregrosa et al., 2015), the present study shows that the subsequent career is also influenced by resources other than education and work experience, such as parental socio-economic status or popularity as an athlete. In particular, clusters that are characterized by a combination of various resources had several opportunities in working life, whereas the other two clusters fared less well. However, a lack of educational certificates could be compensated for by athletic success and popularity, provided that the vocational activity was pursued in sport. Overall, the findings suggest that the post-sport career is a phenomenon constructed from the resources available in a particular context. Thus, there is a significant relationship between the resources of athletes and their subsequent vocational career. These findings may help career counsellors to better understand athletes' career development options and provide services of ever-improving quality. There are several limitations of this study, especially the retrospective design or the limited generalizability of the results (Swiss athletes only).

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SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Poster Session

Thursday 10.02.2022

Main room *Chair: A. Raberin*

13:30 – 14:20

Speaker	Affiliation	Title
Schön Patrick	ETH Zürich	*Exercise Limitation in Adult Fontan Patients: The Role of Respiratory and Skeletal Muscles*
Cody Robyn	University of Basel	*The lived experience of a physical activity counseling intervention to promote physical activityamong people with major depression – A qualitative study*
Ludyga Sebastien	University of Basel	*The influence of motor skills on cognitive control deficits in children and adolescents born very preterm*
Bischoff Clémentine	University of Basel	*Effectiveness of an individualized vibration training on symptom reduction of chemotherapy-induced peripheral polyneuropathy - a randomized controlled trial (VANISH)*
Guyot Robin	University of Lausanne	*The media coverage of women's football: the case of the Swiss Women's Super League during the 2020-2021 season*
Besson Cyril	CHUV-University of Lausanne	*Intra-individual effect of hydration and exercise on heart rate variability: a single case study*
Benbouhou Raphaël	University of Lausanne	*The Franco-Spanish relations through the prism of football (1922-1968). Circulations, imaginaries, diplomacy*
Mücke Manuel	University of Basel	*Associations of physical activity and fitness with stress reactivity in children aged 10-13 years*
Nigg Claudio	University of Bern	*The effect of a brief online video-based physical activity intervention on physical activity, sleep, mood, stress, and resilience: A randomized control trial*
Böni André	ETH Zürich	*Assessing balance abilities of healthy adults on an outdoor fitness and leisure trail*
Hohberg Vivien	University of Basel	*Blended care interventions to promote physical activity - A systematic review of randomized controlled trials*
Wälti Marina	University of Basel	*Basic motor competencies and health-related quality of life in primary school children*

SPORTWISSENSCHAFTLICHE GESELLSCHAFT DER SCHWEIZ
SOCIETE SUISSE DES SCIENCES DU SPORT

Ulrich Gert	Careum Foundation	*Is Healthcare a Team Sport? Widening our Lens on Interprofessional Collaboration and Education in Sport Science and Exercise Medicine – Results from a Webinar*
Wang Linjia	University of Lausanne	*Preventive effects of moderate vs high-intensity exercise in normoxia vs hypoxia in mice on experimental atherosclerotic plaque formation.*
Gerber Markus	University of Basel	*Macronutrients and the development of depressive symptoms in young elite athletes from Northwestern Switzerland*
Basil Achermann	Swiss Federal Institute of Sport Magglingen	*Optical tracking of barbell kinematics for low-cost resistance training monitoring*