

6. Jahrestagung der SGS in Freiburg - 13. bis 14. Februar 2014



Bewegungs- und Sportwissenschaften, Universität Freiburg

# 6. Jahrestagung der Sportwissenschaftlichen Gesellschaft der Schweiz (SGS)

## Book of Abstracts

Sportwissenschaft in Bewegung - Bewegung in der Sportwissenschaft

SPORTWISSENSCHAFTLICHE  
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## Compliance. Herausforderungen für die bewegungsbezogene Gesundheitsforschung

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### Introduction:

Die regelmäßige Teilnahme an einer gesundheitsförderlichen Intervention ist mitentscheidend für deren Erfolg. Eine korrekte Einschätzung der Wirksamkeit von Interventionen hängt somit auch von der diesbezüglichen Compliance ab. In diesem Beitrag soll aufgezeigt werden, welche weitgreifenden Probleme für die Forschung im Bereich der Gesundheitsförderung mit unterschiedlichen Formen der Compliance verbunden sind und ob ggf. Lösungsansätze existieren.

### Methods/Results.

Die Tragweite von Compliance-Effekten erschließt sich, wenn Compliance nicht nur auf die reine Interventionstreue, sondern bspw. bereits auf die Bereitschaft zur Interventionsteilnahme oder gar auf die Bereitschaft zur Teilnahme an einer Studie (Williams et al., 2011) bezogen wird. Für den Bereich der betrieblichen Gesundheitsförderung ist beispielsweise nachgewiesen, dass die Bereitschaft zur Teilnahme an diesbezüglichen Maßnahmen (wie auch die dauerhafte Teilnahme) mit dem Alter (mittleres Alter), dem Geschlecht (weiblich) vor allem mit dem Gesundheitszustand (eher gesund) assoziiert sind (Robroek et al., 2009). Ergebnisse wissenschaftlicher Studien in diesem Bereich lassen sich somit nur auf eine Population übertragen, die im eigentlichen Sinne nicht der angestrebten (weniger gesunden) Zielgruppe entspricht. Es finden sich zudem Hinweise auf systematische Effekte, die bereits durch das Studiendesign hervorgerufen werden. Bei gesundheitsbezogenen Präventionsstudien etwa, tendieren Personen dazu, Studienteilnahme zu verweigern und/oder abzubrechen, wenn sie in nicht präferierte Studiengruppen zugeteilt werden (Ji et al., 2008). Martinson et al. (2010) konnten nachweisen, dass es aufgrund einer solchen sog. „double volunteer bias“ zu maskierten Selektionseffekten kommen kann. Ein Nachweis von systematischen Selbstselektionen ist dann nicht mehr möglich, was wiederum eine Überschätzung der externen Validität zur Folge haben kann. Weitere Beispiele für Compliance-Effekte werden vorgestellt, die nicht nur bei Probanden sondern bei allen Beteiligten der Gesundheitsforschung nachweisbar sind.

### Discussion/Conclusion:

In den aktuellen Standards zur Evidenzprüfung werden die meisten dieser Compliance-Effekte nicht berücksichtigt. Hier liegt das Augenmerk meist auf der Sicherung von interner Validität. „Störungen“ durch Non-Compliance werden hierbei durch spezielle Forschungsdesigns (bspw. Randomisierung) und/oder Analysemethoden (z.B. Kovarianzanalysen etc.) minimiert. Probleme, die eine Non-Compliance für die externe Validität darstellen kann, werden meist unterschätzt (Victoria et al., 2004). Lösungen zur besseren Einschätzung der externen Validität finden sich in neueren Ansätzen der Evaluationsforschung oder der so genannten „translational research“ (Akers et al., 2010).

### References:

- Akers, J. D., Estabrooks, P. A., & Davy, B. M. (2010). Translational research: bridging the gap between long-term weight loss maintenance research and practice. *Journal of the American Dietetic Association, 110*(10), 1511–1522.
- Ji, P., DuBois, D. L., Flay, B. R., & Brechling, V. (2008). “Congratulations, You Have Been Randomized Into the Control Group!(!?)”: Issues to Consider When Recruiting Schools for Matched-Pair Randomized Control Trials of Prevention Programs. *Journal of School Health, 78*(3), 131–139.
- Martinson, B. C., Crain, A. L., Sherwood, N. E., Hayes, M., Pronk, N. P., & O’Connor, P. J. (2010). Population Reach and Recruitment Bias in a Maintenance RCT in Physically Active Older Adults. *Journal of physical activity & health, 7*(1), 127–135.
- Robroek, S., Lenthe, F. van, Empelen, P. van, & Burdorf, A. (2009). Determinants of participation in worksite health promotion programmes: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 6*(1), 26.
- Victoria, C. G., Habicht, J.-P., & Bryce, J. (2004). Evidence-based public health: moving beyond randomized trials. *American journal of public health, 94*(3), 400–405.
- Williams, B., Irvine, L., McGinnis, A. R., McMurdo, M. E. T., & Crombie, I. K. (2007). When „no“ might not quite mean „no“; the importance of informed and meaningful non-consent: results from a survey of individuals refusing participation in a health-related research project. *BMC health services research, 7*, 59.

**Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg**

**Title:**

Lucid dream practice in German and Japanese athletes: A questionnaire study.

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**Abstract:**

**Introduction:**

Mental practice is the cognitive rehearsal of a motor task in the absence of overt physical movement. A different and rather unknown kind of mental rehearsal is practice in lucid dreams (Erlacher, Stumbrys & Schredl 2011-12). Within lucid dreams (LD), the dreamer is aware of the dream state and thus able to control the ongoing dream content. Previous studies could demonstrate that it is possible to practice motor tasks during LD and doing so improved performance while awake (Erlacher & Schredl, 2010). However, little is known about the prevalence of LD practice in sport. The aim of the present study was to estimate the prevalence of LD in athletes, how often they use their LD state for rehearsal and whether they had experienced an improvement in daytime performance.

**Methods:**

The sample included 840 German (483 m, 357 w) and 1323 Japanese (1000 m, 323 w) athletes. Their mean age was 20.4 years (G: 21.6, J: 19.7), ranging from 11 to 55 years. The athletes were recruited through personal contacts or through their coaches and volunteered to participate in a questionnaire study about sleep and dream habits. Participants were involved in various sports ranging from team sports (e.g., basketball, soccer) to individual sports (e.g., athletics, figure skating). The athletes had been practicing their sport for an average of 9.1 years (G: 11.1, J: 7.9) and were practicing an average of 14.4 hours (G: 11.1, J: 16.7) per week (excluding additional time for competitions or other sports). The questionnaire included the following questions: How often they experience LD using an 8-point scale (To ensure a clear understanding of LD, a definition was presented); If they have ever used LD to practice their sport while dreaming and if this was confirmed by the athletes, then they were asked if they had an impression that their performance had improved by their practice during the LD.

**Results:**

About 47% (G: 57%, J: 41%) of the athletes stated that they experienced a LD at least once in their lives, 20% (G: 24%, J: 18%) are frequent LDers (having one or more lucid dreams per month), and 9% (G: 9%, J: 9%) of the LDers used this dream state to practice sport skills, and the majority of those athletes had the impression that the rehearsal within the LD improved their performance in wakefulness.

**Discussion/Conclusion:**

The results indicate that about 47% of the athletes stated that they experienced a lucid dream at least once in their lives and about 20% are frequent lucid dreamers and about 9% of the athletes who had lucid dreams have used their dreams to practice sports skills. For the German sample, the prevalence rate of LD in professional athletes is similar as in general population, however the rough estimate of the percentage of lucid dreams compared to all dreams in athletes was found to be nearly twice as high as in general population (14.5% vs. 7.5%). For the Japanese sample no representative data are available, however, the cultural differences seems to play a minor role. The possibilities of lucid dream practice for professional sports will be discussed.

**References:**

- Erlacher, D. & Schredl, M. (2010). Practicing a motor task in a lucid dream enhances subsequent performance: A pilot study. *The Sport Psychologist*, 24(2), 157-167.
- Erlacher, D. & Schredl, M. (2008). Do REM (lucid) dreamed and executed actions share the same neural substrate? *International Journal of Dream Research*, 1(1), 7-13.
- Erlacher, D., Stumbrys, T., & Schredl, M. (2011-2012). Frequency of lucid dreams and lucid dream practice in German athletes. *Imagination, Cognition and Personality*, 31(3), 237-246.

**Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg**

**Title:**

High self-perceived exercise exertion before bedtime is associated with higher objectively assessed sleep efficiency

**Authors:** Serge Brand, PhD<sup>1,2\*</sup>, Nadeem Kalak, MSc<sup>1\*</sup>, Markus Gerber, PhD<sup>2</sup>, Roumen Kirov, MD, PhD<sup>3</sup>, Uwe Pühse, PhD<sup>2</sup>, and Edith Holsboer-Trachsler, MD<sup>1</sup>

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3 Institute of Neurobiology, Bulgarian Academy of Sciences, Sofia, Bulgaria

**Abstract:**

**Introduction:**

**Objective:** To assess the association between self-perceived exercise exertion during an acute bout of moderate to vigorous exercise before bedtime and objectively measured sleep.

**Methods:** Fifty-two regularly exercising adolescents (mean age = 19.70 years; 54% females) underwent sleep-EEG recordings 1.5 hours after accomplishing moderate to vigorous exercising in the evening. Before sleeping, participants answered an item regarding the self-perceived degree of exercise exertion.

**Results:** High objectively assessed sleep efficiency was positively correlated with high self-perceived exercise exertion during acute bout of exercise before bedtime ( $r = .69, p < .001$ ); accordingly, self-perceived exercise exertion explained 48% of the variance of sleep efficiency ( $R^2 = .48$ ).

**Conclusions:** Against expectations and against general recommendations for sleep hygiene, at least among a sample of adolescents, high self-perceived exertion during moderate to vigorous exercise before bedtime was positively associated with increased objective sleep efficiency.

**Key words:** exercise, perceived exertion, sleep-EEG, sleep efficiency, adolescents, recommendation of sleep hygiene

**Title:**

Biomechanical differences between “Deadlifts” and “Good-Mornings”

**Authors:** Schellenberg F<sup>1</sup>, Oberhofer K<sup>1</sup>, Lindorfer J<sup>1</sup>, List R<sup>1</sup>, Taylor WR<sup>1</sup>, Lorenzetti S<sup>1</sup>,

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**Abstract:****Introduction:**

Multi-joint resistance exercises, including “Deadlifts” (DLs) and “Good-Mornings” (GMs), are commonly used for performance enhancement, prevention or rehabilitation of injuries to the musculoskeletal structures in the back and the lower limbs (Radcliffe, 2007). Despite their widespread use, the effects of different lower limb and trunk motion on the resulting loading conditions in the joints remain unknown. The aim of this study was to compare segmental kinematics and joint moments of the spine and the lower limbs between the DL and the GM strength exercises.

**Methods:**

The kinetics and kinematics of 13 subjects (average age 24.5±4.3y, mass 74±11kg, height 180±7cm), performing GMs and DLs exercises with an additional 25% (GMs), 25% and 50% (DLs) body weight (BW) on the barbell, were analysed. The study was approved by the Ethics committee of the ETH Zurich, Switzerland (EK 2012-N-57). Kinetic and kinematic data were captured using force plates and a 3D motion analysis system with 55 markers on leg, pelvis, shoulder and arms, 22 markers on the back and 2 markers attached to the barbell (List et al. 2013). Moments in the sagittal plane of the knee, hip and spine at level L4/L5 were derived using an inverse dynamics approach with quasi-static solution (Lorenzetti et al. 2012). The influences of the varying barbell loads and exercise types on the maximum joint angles and moments were analysed using a multiple repeated-measures ANOVA ( $p < 0.05$ ) with Bonferroni adjustment.

**Results:**

The maximal flexion angles of the knee were significantly different between the two exercises, with  $5.3 \pm 6.7^\circ$  for GMs and  $107.8 \pm 22.4^\circ$  and  $103.4 \pm 22.6^\circ$  for DLs with 25% and 50% BW, respectively. Significantly smaller flexion angles were also found for the hip during GMs compared to DLs. No differences in the kinematics of the trunk between the two exercises were observed. For DLs, the resulting sagittal moment in the knee was an external flexion moment, whereas during GMs an external extension moment was present. Importantly, the sagittal knee joint moments did not increase with heavier weights on the barbell during DLs whereas higher sagittal moments were found at the hip and spinal level L4/L5. With 25% BW, DLs resulted in a lower sagittal moment at the hip compared to GMs while generating the same sagittal moment at L4/L5.

**Discussion/Conclusion:**

The biomechanical differences between the two exercises were mainly present in the lower limbs, with similar results for the range of motion and the flexion moments in the spine at level L4/L5. In order to prevent or rehabilitate from knee injuries, GMs may be the more suited exercises, with significantly smaller knee angles during exercise performance compared to DLs. DLs with 50% BW should be chosen to strengthen the hip throughout a large range of flexion angles, resulting in the highest sagittal moment and hip range of motion. Though, great care should be taken to ensure core stability of the trunk during DLs using additional weights due to higher loading of the spine.

**References:**

List, R., Gülay, T., Stoop, M., Lorenzetti, S. (2013). *Kinematics of the Trunk and the Lower Extremities During Restricted and Unrestricted Squats*. J Strength & Conditioning Research, 27, 1529- 1538.

Lorenzetti, S., Gülay, T., Stoop, M., List, R., Gerber, H., Schellenberg, F., Stüssi, E. (2012). *Comparison of the angles and corresponding moments in the knee and hip during restricted and unrestricted squats*. J Strength & Conditioning Research, 26, 2829–2836.

Radcliffe, J.C. (2007). *Functional Training for athletes at all levels*. Berkley, CA, Ulysses Press.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

An Experimental Study on Vibrations, Posture, and the Stabilization of Gaze

**Authors:** Kredel R<sup>1</sup>, Grimm A<sup>1</sup>, & Hossner EJ<sup>1</sup>.

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### Abstract:

#### Introduction

In recent years, more and more research focused on the phenomenon of perception-action-coupling, that is, the tight relationship between how and what is perceived and the type and quality of movement output to solve (complex) motor tasks. However, to date, most research focused on the effects of perception on motor control, not vice versa, which would constitute the facilitation of perception by improved motor control. Therefore, in a series of experiments, the question is asked whether improved motor control can also help to stabilize gaze what, in turn, may be essential for maintaining other control mechanisms (e.g., modeling of future states, Franklin, & Wolpert, 2011) in an optimal range. This is of particular interest in situations in which the task exhibits unpredictable components as it is the case, e.g., in downhill skiing. The first study of this series focusses on effects under predictable conditions in order to check whether visual performance can be altered by posture per se.

#### Method

In a 3x2x4 within-subject ANOVA design, 72 participants conducted three tests on visual acuity and contrast (Landolt / Grating and Vernier) in two different postures (standing vs. squat) on a platform vibrating at four different frequencies (ZEPTOR; 0 Hz, 4 Hz, 8 Hz, 12 Hz; no random noise; constant amplitude) in a counterbalanced order with 1-minute breaks in-between. In addition, perceived exertion (Borg) was rated by participants after each condition.

#### Results

For Landolt and Grating, significant main effects and interactions are revealed, representing higher acuity/contrast thresholds for standing and for higher frequencies in general and increasing posture differences with increasing frequencies ( $p < .01$ ). Overall, performance could be maintained at the 0 Hz level up to a frequency of 8 Hz, if bending of the knees was allowed. The fact that this result is not only due to exertion is proved by the Borg ratings, which show a constant increase over frequencies and decreasing posture differences with increasing frequencies ( $p < .01$ ). The same pattern, although not significant, is revealed for the Vernier test.

#### Discussion

Apparently, postures improving motor control not only turn out to help to resist disturbances but also assist in stabilizing gaze in spite of these perturbations. Consequently, studying the interaction of these control mechanisms in complex unpredictable environments seems to be a fruitful field of future research.

### References:

Franklin, D. W., & Wolpert, D. M. (2011). Computational mechanisms of sensorimotor control. *Neuron*, 72, 425-442.

**Title:** Effects of anxiety on decision making and visual search behaviour in complex sport situations

**Authors:** Vater, Christian<sup>1</sup> & Williams, Mark A.<sup>2</sup>

<sup>1</sup>Faculty of Sport Science, University of Leipzig, Germany (since September 2013: assistant at Institute of Sport Science, University of Bern, Switzerland); <sup>2</sup>Sport Sciences, Brunel University London, UK

**Abstract:**

**Introduction:**

Current empirical findings indicate that the efficiency of decision making (both for experts and near-experts) in simple situations is reduced under increased stress (Wilson, 2008). Explaining the phenomenon, the Attentional Control Theory (ACT, Eysenck et al., 2007) postulates an impairment of attentional processes resulting in a less efficient processing of visual information. From a practitioner's perspective, it would be highly relevant to know whether this phenomenon can also be found in complex sport situations like in the game of football. Consequently, in the present study, decision making of football players was examined under regular vs. increased anxiety conditions.

**Methods:**

22 participants (11 experts and 11 near-experts) viewed 24 complex football situations (counterbalanced) in two anxiety conditions from the perspective of the last defender. They had to decide as fast and accurate as possible on the next action of the player in possession (options: shot on goal, dribble or pass to a designated team member) for equal number of trials in near and far distance conditions (based on the position of the player in possession). Anxiety was manipulated via a competitive environment, false feedback and ego threats. Decision time and accuracy, gaze behaviour (e.g., fixation duration on different locations) as well as state anxiety and mental effort were used as dependent variables and analysed with 2 (expertise) x 2 (distance) x 2 (anxiety) ANOVAs with repeated measures on the last two factors. Besides expertise differences, it was hypothesised that, based on ACT, increased anxiety reduces performance efficiency and impairs gaze behaviour.

**Results and Discussion:**

Anxiety was manipulated successfully, indicated by higher ratings of state anxiety,  $F(1, 20) = 13.13, p < .01, \eta_p^2 = .40$ . Besides expertise differences in decision making – experts responded faster,  $F(1, 20) = 11.32, p < .01, \eta_p^2 = .36$ , and more accurate,  $F(1,20) = 23.93, p < .01, \eta_p^2 = .55$ , than near-experts – decision time,  $F(1, 20) = 9.29, p < .01, \eta_p^2 = .32$ , and mental effort,  $F(1, 20) = 7.33, p = .01, \eta_p^2 = .27$ , increased for both groups in the high anxiety condition. This result confirms the ACT assumption that processing efficiency is reduced when being anxious. Replicating earlier findings, a significant expertise by distance interaction could be observed,  $F(1, 18) = 18.53, p < .01, \eta_p^2 = .51$ , with experts fixating longer on the player in possession or the ball in the near distance and longer on other opponents, teammates and free space in the far distance condition. This shows that experts are able to adjust their gaze behaviour to affordances of displayed playing patterns. Additionally, a three way interaction was found,  $F(1, 18) = 7.37, p = .01, \eta_p^2 = .29$ , revealing that experts utilised a reduced number of fixations in the far distance condition when being anxious indicating a reduced ability to pick up visual information. Since especially the visual search behaviour of experts was impaired, the ACT prediction that particularly top-down processes are affected by anxiety could be confirmed. Taken together, the results show that sports performance is negatively influenced by anxiety because longer response times, higher mental effort and inefficient visual search behaviour was observed. From a practitioner's perspective, this finding might suggest to prefer (implicit) perceptual cognitive training; however, this recommendation needs to be empirically verified in intervention studies.

**References:**

- Eysenck, M. W., Derakshan, N., Santos, R., & Calvo, M. G. (2007). Anxiety and cognitive performance: Attentional control theory. *Emotion, 7*, 336-353.
- Wilson, M. (2008). From processing efficiency to attentional control: A mechanistic account of the anxiety-performance relationship. *International Review of Sport and Exercise Psychology, 1*, 184-201.



## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Analysis and training of gaze behaviour in shooting in ice hockey

**Authors:** Herzig R<sup>1</sup>, Fuchslocher J<sup>1</sup>, Altorfer R<sup>1</sup>., Celio M<sup>2</sup>

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### Abstract:

#### Introduction:

Zahlreiche Studien haben gezeigt, dass Elitesportler ein effizienteres und adäquateres Blickverhalten haben als weniger erfolgreiche Athleten (Vickers, 2007). Differenzen wurden hauptsächlich bei der Fixationsdauer und der Anzahl Fixationen beobachtet. Erfolgreichere Sportler zeichnen sich durch weniger Fixationen von längerer Dauer aus (Vaeyens et al., 2007). Die Studie soll aufzeigen, in welchen Punkten sich die Blickbewegungs-Strategien von Spielern mit einer hohen Trefferquote von jenen mit einer tiefen Trefferquote bei einem indirekten Torschuss nach Pass im Eishockey unterscheiden.

#### Methods:

22 Eishockeyspieler (13 NLA-Spieler, 22.6 ± 2.2 Jahre, und 9 Elite-Junioren, 17.8 ± 0.7 Jahre) nahmen an der Studie teil. Die Spieler erhielten vom Mitspieler einen diagonalen Rückpass in einem Winkel von 45° vor das Tor. Start- und Zielzone des Passes waren auf dem Synthice markiert. Der Puck sollte 10m vor dem Tor angenommen und mittels Handgelenkschuss in die vor jedem Versuch vom Testleiter vorgegebene Ecke der Torwand gespielt werden. Jeder Spieler absolvierte 20 Schüsse, die mit einem Eyetracker „Mobile Eye“ (Applied Sciences Laboratory, 3100H) und einer externen Videokamera (Panasonic NV-GS320) aufgezeichnet wurden. Pro Spieler wurden die ersten fünf Treffer und die ersten fünf Fehlschüsse ausgewertet. Dazu wurde zunächst die Fixationsdauer der Objekte „Puck“, „Eis“ und „Torecke“ der fünf Treffer resp. Fehlschüsse gemittelt. Anhand der Pearson-Methode wurden diese anschliessend in Korrelation zur Trefferquote gesetzt und auf Unterschiede zwischen erfolgreicheren und weniger erfolgreichen Spielern untersucht

#### Results:

Von den 22 getesteten Spielern konnten 11 Elite- und 8 Nachwuchsspieler ausgewertet werden. Dabei wurden im zweiten Teil der Pass-Schuss-Situation signifikante Unterschiede im Blickverhalten erkennbar. Je länger die Torecke fixiert wurde, desto höher war grundsätzlich die Trefferquote ( $r = 0,58$ ,  $R^2 = 0,33$ ;  $p < 0,05$ ). Es zeigte sich zudem, dass die gesamte Fixationsdauer, und somit auch die Trefferquote, stark mit einer höheren prozentualen Fixationsdauer der Torecke in der Schussphase zusammenhängt ( $r = 0,84$ ;  $p < 0,05$ ).

#### Discussion/Conclusion:

Die Studie konnte Unterschiede im Blickverhalten von erfolgreichen und weniger erfolgreichen Spielern aufzeigen. Für die getestete Pass-Schuss-Situation bildet die früher beginnende und vor allem stabilere Fixation der Torecke während der Schussbewegung den wichtigsten blicktechnischen Kernpunkt. Die Trefferquote kann zu 33% durch das Blickverhalten erklärt werden, was dessen Wichtigkeit unterstreicht. Die Erkenntnisse werden deshalb als Ergänzung zu den bestehenden technischen Keypoints in die Ausbildung der Trainer und in den Trainingsalltag der Spieler integriert. Dazu wurden spezifische Übungen erarbeitet und bestehende Übungen angepasst.

#### References:

- Vaeyens, R., Lenoir, M., Williams, A.M., Mazyn, L., & Philippaerts, R.M. (2007). The effects of task constraints on visual search behavior and decision-making skill in youth soccer players. *Journal of Sport and Exercise Psychology*, 29, 156-175.
- Vickers, J.N. (2007). *Perception, cognition, and decision training*. Champaign: Human Kinetics.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Seeing or Perceiving? The Relevance of the Quiet Eye Location

**Authors:** Klostermann, A.<sup>1</sup>, Hossner, E.-J.<sup>1</sup>

<sup>1</sup>Institute of Sport Science, University of Bern, Switzerland

### Abstract:

#### Introduction:

The functionality of the final fixation before movement initiation (Quiet Eye, QE) for superior motor performance is well documented (Vickers, 2007). However, underpinning mechanisms have only been studied rudimentarily. Among others, it remains unclear whether the perception of visual information (e.g., the position of a target) within the QE period conditions the phenomenon's efficiency strengthening a cognitive explanation for this phenomenon. Consequently, in a targeting task it was tested whether the duration of presented target information within final fixation duration of different lengths would differentially affect throwing performance. It was expected to find an efficiency of the QE as function of target presentation duration rather than of final fixation duration.

#### Methods:

In a within-subject design, final fixation onset and target onset were manipulated using an experimental paradigm in which 20 participants had to throw balls as accurately as possible at a virtual target disk (cf. Klostermann et al., 2013). The manipulation consisted of a peripherally displayed flicker cue to evoke a final fixation earlier or later in time at one of four possible target positions at which the target disk was presented correspondingly either immediately or delayed relative to the expected fixation onset. As variables QE onset and offset – i.e. beginning and end of the final fixation on the target position – as well as the radial error (RE) were calculated and analyzed with a 2 (final fixation onset) x 2 (target onset) ANOVA with repeated measures and planned t-tests.

#### Results:

The QE manipulation was successful as independent of target onset, earlier QE onsets were found in the early compared to the late final fixation onset condition,  $F(1, 19) = 35.5, p < .01, \eta_p^2 = .65$ . No differences in QE offset were revealed. Above that, the RE was significantly lower in the immediate compared to the delayed target onset condition,  $F(1, 19) = 4.5, p < .05, \eta_p^2 = .19$ . Finally, a significant final fixation onset x target onset interaction was found,  $F(1, 19) = 5.3, p < .05, \eta_p^2 = .22$ , resulting from performance differences between the early final fixation onset / delayed target onset condition and the remaining three conditions (all  $ps < .05$ ) which did not differ from each other (all  $ps > .50$ ).

#### Discussion:

The results support the suggested relevance of perceiving target information within the QE period as throwing performance solely depended on the duration in which information about the actual target position could be perceived. This finding indicates that it is not the length of the QE duration per se that matters but the efficient use of this duration for processing task relevant visual information. Most notably, a comparison of the two conditions in which only the final fixation but not the target presentation duration differed particularly supports this interpretation since no performance differences appeared. Further evidence was presented, emphasizing the functionality of the QE for offline parameterization processes in the framework of a cognitive explanation.

#### References:

- Klostermann, A., Kredel, R., & Hossner, E.-J. (2013). The "Quiet Eye" and motor performance: Task demands matter! [Electronic Version]. *Journal of Experimental Psychology: Human Perception & Performance*. doi: 10.1037/a0031499
- Vickers, J. N. (2007). *Perception, cognition, and decision training. The quiet eye in action*. Champaign, IL: Human Kinetics.

**Title:** Step length after discrete perturbation predicts accidental falls and fall-related injury in elderly people with a range of peripheral neuropathy

**Authors:** Allet L<sup>1,2,3</sup>, Kim H<sup>4</sup>, Ashton-Miller J<sup>4,5</sup>, De Mott T<sup>2</sup>, Richardson JK<sup>2</sup>

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<sup>2</sup>Department of Physical Medicine & Rehabilitation, University of Michigan, Ann Arbor, Michigan, USA

<sup>3</sup>Health Care Directorate, University Hospitals and University of Geneva, Geneva, Switzerland

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**Abstract:**

**Introduction:**

Distal symmetric polyneuropathy increases fall risk due to inability to cope with perturbations. Given the importance of walking to the health of elderly, there is a need to identify the lower limb sensorimotor functions essential to cope with perturbations and avoiding falls. To date few studies have investigated the relationship between lower limb neuromuscular function and surface perturbations and no study has evaluated the relationships between lower limb sensorimotor function and a discrete, unanticipated perturbation. We aimed to 1) identify the frontal plane lower limb sensorimotor functions which are necessary for robustness to a discrete, underfoot perturbation during gait; and 2) determine whether changes in the post-perturbed step parameters could distinguish between fallers and non-fallers.

**Methods:**

Forty-two subjects (16 healthy old and 26 with diabetic PN) participated. Frontal plane lower limb sensorimotor functions were determined using established laboratory-based techniques. The subjects' most extreme alterations in step width or step length in response to a perturbation were measured. The perturbation was induced with a specific designed shoe, which challenged lateral (i.e., frontal plane) control, which is relevant given the greater injury potential of lateral falls in older adults. The subjects were then followed prospectively to record falls and fall-related injuries.

**Results:**

Ankle proprioceptive threshold (APrT;  $p = .025$ ) and hip abduction rate of torque generation (RTG;  $p = .041$ ) independently predicted extreme step length after medial perturbation, with precise APrT and greater hip RTG allowing maintenance of step length. Injured subjects demonstrated greater extreme step length changes after medial perturbation than non-injured subjects (percent change =  $18.5 \pm 9.2$  vs.  $11.3 \pm 4.57$ ;  $p = .01$ ).

**Discussion/Conclusion:**

The ability to rapidly generate frontal plane hip strength and/or precisely perceive motion at the ankle is needed to maintain a normal step length after perturbation, a parameter which distinguishes between subjects sustaining a fall-related injury and those who did not.

**Title:** Prefrontal Cortex Activation in Older Adults During Walking: a Near-Infrared Spectroscopy Study.

**Authors:** Eggenberger P<sup>1</sup>, Schumann M<sup>1</sup>, Wolf M<sup>2</sup>, de Bruin ED<sup>1</sup>.

<sup>1</sup>Institute of Human Movement Sciences and Sport, Department of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland

<sup>2</sup>Biomedical Optics Research Laboratory, Clinic of Neonatology, University Hospital Zurich, Zurich, Switzerland

**Abstract:**

**Introduction:** Attention, as a part of the executive functions, is important in relation to falls in elderly (Mirelman et al., 2012). The prefrontal cortex (PFC) has been associated with the execution of attention demanding tasks (Cabeza and Nyberg, 2000). A study by Suzuki et al. (2004) has shown increased activation of the PFC in younger adults at the initiation of different walking speeds on a treadmill. The aim of our study was to investigate PFC activation in older adults during an intermittent walking task on a treadmill. We hypothesized that levels of oxygenated hemoglobin (HbO<sub>2</sub>) in the PFC were elevated during normal and fast walking speeds.

**Methods:** 39 elderly (mean age 76.3±7 years) participated in this study. Participants performed an intermittent treadmill walking protocol, during which the activation of the right and left PFC was assessed using near-infrared spectroscopic (NIRS) imaging technique. We measured HbO<sub>2</sub>, deoxygenated hemoglobin (Hb), and total hemoglobin (THb). The treadmill walking protocol consisted of eight 30-second periods at normal, individual preferred walking speed and eight 30-second periods at fast walking speed (2 km/h above normal walking speed). Each walking period was followed by a 30-second rest period at very slow treadmill speed (0.2 km/h). Periods of normal and fast walking were executed in random order, without participants knowing when a different speed condition started and at which speed walking was required. Time triggered averages were calculated over all sixteen walk-rest-periods of each participant and over all 39 participants. The averaged values in both the walking and the resting periods were then compared applying a paired t-test.

**Results:** During both normal and fast walking speed and between the right and left PFC, levels of HbO<sub>2</sub> were significantly elevated compared to the resting period ( $p < 0.001$ , one-tailed). For the fast walking condition, HbO<sub>2</sub> concentration was significantly higher than in the normal walking condition (right PFC:  $p < 0.001$ , one-tailed, left PFC:  $p < 0.05$ , one-tailed). Comparing HbO<sub>2</sub> during walking in the right and left PFC, we found greater values in the left PFC for both walking speeds ( $p < 0.001$ , one-tailed).

**Discussion/Conclusion:** Our findings are in line with the results of Suzuki et al. (2004) investigating young adults. While in this study with younger adults PFC activation was only found within the first ten to fifteen seconds of walking, we found an additional activation phase after about 10 to 30 seconds of walking in our older adults. This finding might reflect an aging effect, in terms of attentional needs for walking tasks in older people under challenging conditions. Future research should establish whether PFC activation is sensitive to changes due to physical interventions; e.g. through video-game based training.

**References:**

- [1] Mirelman, A., et al., *Executive function and falls in older adults: new findings from a five-year prospective study link fall risk to cognition*. PLoS One, 2012. 7(6), e40297.
- [2] Cabeza, R. and Nyberg, L., *Imaging cognition II: An empirical review of 275 PET and fMRI studies*. J Cogn Neurosci, 2000. 12(1): p. 1-47.
- [3] Suzuki, M., et al., *Prefrontal and premotor cortices are involved in adapting walking and running speed on the treadmill: an optical imaging study*. Neuroimage, 2004. 23(3): p. 1020-1026.

**Title:** Usability and Effects of an Exergame-Based Balance Training Program

**Authors:** Wüest S<sup>1</sup>, Borghese NA<sup>2</sup>, Pirovano M<sup>2</sup>, Mainetti R<sup>2</sup>, van de Langenberg R<sup>1</sup>, de Bruin ED<sup>1</sup>

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**Abstract:**

**Background:** For best recovery results post-stroke, an intense structured therapy program with numerous repetitions of various challenging tasks is required over an extended period of time. Assuming that patients' motivation for sustained rehabilitation practice contributes to therapy effectiveness, the need for a rehabilitation technique maintaining stroke patients' motivation becomes obvious. Virtual reality applications have emerged as promising tool for creating an engaging rehabilitation environment and, thus, for promoting motor recovery post-stroke. In the research project "Rehabilitative Wayout In Responsive home Environments" (REWIRE), funded by FP7 of the EU, a novel virtual reality exergame-based rehabilitation intervention has been designed that aims to minimize stroke-induced walking impairments. New treatment programs should be tested on usability and effects prior to a larger clinical exploratory study [1, 2].

**Objective:** This study was a small-scale intervention assessing (1) usability and acceptance of the novel exergame-based treatment intervention, (2) the potential of retaining individuals in the intervention, and (3) whether the intervention had some effects on balance and gait performance. Healthy elderly were used as a convenience sample.

**Methods:** Sixteen elderly subjects (13 females / 3 males) were provided with the study training intervention based on five newly developed exergames. The training was performed three times a week for 20 minutes each. Participants were required to attend 36 supervised training sessions. An adapted version of the Technology Acceptance Model (TAM) questionnaire evaluated participants' acceptance of the intervention. Baseline and post-intervention assessments focused on attrition and adherence. Secondary outcome measures included the Berg Balance Scale, the 7-Meter Timed Up and Go test, the Short Physical Performance Battery and a walking parameter analysis.

**Results:** Out of the 16 participants, 13 completed the study (attrition rate = 18.8%). The 13 participants who completed the training program attended all 36 training sessions (adherence rate = 100%). These individuals revealed a high TAM score level at the end of training, indicating high acceptance rates. Berg Balance Scale scores increased significantly from 51.7 (3.3) to 54.8 (1.4) points ( $p = .007$ ;  $r = .51$ ). There was a significant improvement in the 7-Meter Timed Up and Go test from 19.8 (2.8) to 17.5 (2.4) seconds ( $p = .002$ ;  $r = .56$ ). Short Physical Performance Battery scores increased significantly from 9.9 (1.0) to 11.2 (0.8) points ( $p = .013$ ;  $r = .48$ ). No statistical significance was found for the walking parameters.

**Conclusions:** The usability of the virtual reality exergame-based training intervention was evaluated positive by the participants. Furthermore, findings suggest that the intervention is able to improve gait and balance related physical performance measures of elderly. Further research is warranted to investigate clinical efficacy in a large-scale study with stroke patients.

**Acknowledgments**

This work was partially supported by the REWIRE project ([www.rewire-project.eu](http://www.rewire-project.eu)), funded by the European Commission under the FP7 framework with contract 287713.

**References**

1. Thabane, L., et al., *A tutorial on pilot studies: the what, why and how*. BMC Med Res Methodol, 2010. **10**: p. 1.
2. Bastien, J.M.C., *Usability testing: a review of some methodological and technical aspects of the method*. International Journal of Medical Informatics, 2010. **79**(4): p. E18-E23.

**Title:** Home-based Strength-Balance Training Programs for Independently Living Older People

**Authors:** van het Reve E<sup>1</sup>, Silveira P<sup>2</sup>, Daniel F<sup>2</sup>, Casati F<sup>2</sup>, de Bruin ED<sup>1</sup>

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<sup>2</sup>University of Trento, Italy

**Abstract:**

**Introduction:** Home-based exercise programs can improve physical functioning and health status of elderly subjects. It appears that a successful implementation of exercise interventions presents major challenges for many older people: Monitoring and supporting elderly properly while doing their home-based exercises is essential with respect to training success. We developed an IT-based system -ActiveLifestyle - that offers older adults a home-based strength-training program with incorporated motivation strategies and support features. This study aimed to compare three different home-based training programs with respect to their effect on measures of gait quality and physical performance through planned comparisons between i) tablet based and brochure based interventions, ii) individual and social motivation strategies, and iii) 'active' and 'inactive' participants.

**Methods:** 44 autonomous living elderly (75 ± 6 years old) were assigned to three training groups: social (tablet guided, n=14), individual (tablet guided, n=13), and control (brochure guided, n=17). All groups joined a twelve-weeks progressive home-based strength-balance training program. Outcome measures were gait performance under single and dual task conditions, dual task costs of walking, falls efficacy, and physical performance (SPPB). Furthermore, 'active' (≥75% program compliance) and 'inactive' (<75% program compliance) individuals were compared based on their characteristics and outcome measures.

**Results:** The tablet groups showed significant improvements in single and dual task walking, whereas there were no significant changes observable in the brochure group. Between-groups comparison revealed significant differences for gait velocity (U = 138.5; p = 0.027, r = 0.33) and cadence (U = 138.5, p = 0.026, r = 0.34) during dual task walking at preferred speed in favor of the tablet groups. There was a trend to significantly more 'inactive' participants in the control group when compared with the tablet groups (U = 167, p = 0.058, r = 0.29). The 'active' subjects outperformed the 'inactive' subjects in single and dual task walking, dual task costs of walking, and SPPB. Significant between-groups differences were seen between the tablet groups and the brochure group, in favor of the tablet groups.

**Discussion/Conclusion:** A tablet-based strength-balance training program which allows monitoring and assisting autonomous living older adults while training at home was more effective in improving gait and physical performance when compared to a brochure-based program. Social or individual motivation strategies were equally effective. The most prominent differences were observed between 'active' and 'inactive' subjects. These findings suggest that in older adults a tablet-based intervention enhances training compliance and, hence, presents a more effective way to improve gait.

**Title:** Skilling-up exercise for deconditioned nursing home dwellers

**Authors:** de Bruin ED<sup>1</sup>, Rogan S<sup>2</sup>

<sup>1</sup>Institute of Human Movement Sciences and Sport, Department of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland

<sup>2</sup>Bern University of Applied Sciences, Department of Health, Bern, Switzerland

**Abstract:**

**Introduction:**

Because frail older adults have often been excluded from research little is known about the effects of training in these individuals [1]. Frailty and impaired muscle functioning are closely associated [2]. Dynapenia describes age-associated loss of muscle strength and power leading to increased risk for functional limitations and disability [3,4]. The nervous system's ability to fully activate skeletal muscle voluntarily seems impaired in dynapenia, which might be trained through vibration exercise [5] and video games [6]. This study determined the effects of an 8 weeks stochastic vibration (SR-WBV) and video game training in nursing home dwellers.

**Methods:**

29 frail elderly (87.1 ± 8.7 years) randomly assigned to intervention (INT) and control (SHAM). INT performed 5 sets SR-WBV lasting 5 minutes, with 1 minute rest between sets (base frequency 3 Hz up to 6 Hz, Noise 4) during 5 weeks. From weeks 5 to 8 a video dance game 3 times per week was added. SHAM performed a five-set SR-WBV program lasting five minutes, with 1 minute rest (1 Hz, Noise 1). From week 5 to 8 trampoline exercise 3 times per week was added. Outcomes were the Short physical performance battery (SPPB). A two (groups) x three (time points) ANOVA with Bonferroni correction, with repeated measures on the last factor, was used for analysis ( $p \leq 0.05$ ).

**Results:**

The within subject test indicated a significant time effect for the SPPB parameter:  $F(2,46) = 16$ ,  $p < .001$ . The between groups test indicated that the variable Training reached significance in SPPB  $F(2,46) = 21.23$ ,  $p < .001$ . Where SHAM remained unchanged with SPPB values pre/post = 4.1±1.8/3.9±1.3 points INT shows large improvements 2.8±1.5/6.8±3.5 points.

**Discussion/Conclusion:**

The findings of this study contrast previous reports showing that physical exercise programs for frail older people are less effective on disability outcomes [7]. These findings encourage further examination of the effect of strength exercise training types that specifically focus on aspects of neuromuscular functioning in elderly.

**References:**

[1] Ferrucci et al. JAGS 52:625-634, 2004; [2] Mühlberg & Sieber. Z Gerontol Geriat 37:2-8 (2004); [3] Clark & Manini. Nutrition, 2012. 28(5): 495-503; [4] Manini & Clark. J Gerontol A Biol Sci Med Sci, 2012. 67(1): 28-40; [5] Cochrane. Int J Sports Med 2011; 32: 75- 99; [6] Pichierri et al. BMC Geriatr. 2011;11:29; [7] Daniels et al. BMC Health Serv Res 2008, 8(1):278.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Electro-cortical modulations after the World's Most Challenging Mountain Ultra-Marathon

**Authors:** Spring J<sup>1</sup>, Sallard E<sup>1</sup>, Saugy J<sup>1</sup>, Degache F<sup>2</sup>, Trabucchi P<sup>3</sup>, Millet G<sup>1</sup>, Barral J<sup>1</sup>

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### Abstract:

#### Introduction:

Physiological consequences of the World's most challenging Mountain Ultra-Marathon (MUM) have been recently analysed [5], but little is known about the electro-cortical adaptations after an ultra long-lasting physical exercise combined with resistance to sleep. Most of the researchers using EEG only focused on short bouts of exercise [1] and the very few ones related to brain electrical activity changes during ultra-marathon [2] did not include enough participants nor examined neural generators of changes in scalp voltage in the brain. The purpose of this study was to explore the effects of the MUM on cerebral activity.

#### Methods:

Sixteen runners participated to the experiment (1 female, mean age =  $43 \pm 4.9$ ; range [30 --- 47]; finished time (hour) =  $125 \pm 18$ ; sleep duration: between 5 and 13 hours). EEG was recorded through a 64-channel Biosemi© system during 4 minutes in a resting condition with eyes closed before (PRE) and after (POST) the race. The power of delta (0.5---3.5 Hz), theta (4.0---7.5 Hz) and alpha (8.0---12.0 Hz) frequency bands were compared between PRE and POST sessions for three regions of interest: ROI1 (frontal: AF3, AFz, AF4), ROI2 (central: C1, Cz, C2) and ROI3 (parietal: PO3, POz, PO4). A standardized low-resolution brain electromagnetic tomography (sLORETA) was used for the localization of brain cortical activity [4]. A minimum of 30 4---s epochs of artefact-free resting EEG were used to calculate three-dimensional cortical distribution of the neuronal generators in PRE and POST conditions. Paired samples t---tests were computed for sLORETA power at each voxel.

#### Results:

The results of the two-way ANOVAs showed an interaction in the delta ( $F(2, 14) = 7.67$ ;  $p < 0.05$ ) and theta ( $F(2, 14) = 7.05$ ;  $p < 0.05$ ) bands, that revealed a more significant increase of amplitude in ROI2 in the POST session. In contrast, the interaction in the alpha band ( $F(2, 14) = 13.47$ ;  $p < 0.05$ ) revealed a more significant decrease of amplitude in ROI3. From sLORETA statistical analyses, the comparison between PRE and POST race ( $t_{critical}$  for  $P < 0.1 = 1.21$ ;  $P < 0.05 = 1.27$ ;  $P < 0.01 = 1.40$ ) revealed a decrease of alpha---1 (8---10 Hz) activity in the precuneus (BA 31;  $P < 0.01$ ) and within the occipital lobe (BA 18, 19;  $P < 0.01$ ).

#### Discussion/Conclusion:

To our knowledge, this is the first study that investigates ultra long-lasting exercise changes in brain cortical activity. Alpha power decrease in occipital areas and delta/theta power increase over central regions are strongly associated with a high motivation for sleeping [6]. Increased theta rhythm is also associated with a variety of psychological states including hypnagogic imagery and a decrease of alertness during drowsiness [3]. Electrical source estimations of alpha oscillatory activity identified two main regions that significantly activate after the race: the posterior cingulate cortex (BA 31) and the visual associative area (BA 18, 19) that are related to autobiographic memory and the interpretation of images respectively. These results are discussed in terms of visual hallucinations that are frequently reported by the runners.

#### References:

1. Crabbe, J.B., & Dishman, R. K. (2004). Brain electrocortical activity during and after exercise: a quantitative synthesis. *Psychophysiology*, 41(4), 563---574.  
(ABSTRACT TRUNCATED)



**Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg**

**Title:**

Biomechanical difference between overground and treadmill walking and running

**Authors:** Staudenmann D<sup>1</sup>, Robadey J<sup>1</sup>, Lorenzetti S<sup>2</sup>, Taube W<sup>1</sup>.

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<sup>2</sup>Institute for Biomechanics, ETH Zurich, Switzerland

**Abstract:**

**Introduction:**

Is walking and running biomechanically identical when performed overground (OG) or on a treadmill (TM)? When walking or running, a decrease followed by an increase of the center of mass (COM) forward velocity can be observed [1]. The aim of this study was to compare the mechanical energy variation and the corresponding muscle activity between OG and TM locomotion.

**Methods:**

Ten experienced healthy male runners participated in the experiment. They had to walk and run OG at self-selected velocity before walking/running at the same velocity on the TM. We measured body segment kinematics (Vicon, Plug-in-Gait) and surface EMG of both legs of tibialis anterior (TA), soleus (SO), gastrocnemius medialis/lateralis (GM/GL), rectus femoris (RF), vastus medialis/lateralis (VM/VL) and biceps femoris (BF). Contact phase and the heel-toe delay as well as the landing angle were assessed. The COM in sagittal plane was used to estimate the potential energy ( $E_p$ ), kinetic energies in forward and vertical directions ( $E_{kf}$ ,  $E_{kv}$ ), and the total external mechanical energy ( $E_m$ ). For each step and each energy component we determined the relative energy variation ( $\Delta E$ ) as the ratio of the absolute variation with the mean of the energy extreme. The surface EMG was processed as discussed in a previous study [2]. For each contact and flight phase the average and maximal EMG amplitudes were determined in order to assess the difference between OG and TM locomotion.

**Results:**

The heel-toe delay showed no significant effect for walking ( $p=0.143$ ) but a significant reduction for TM running ( $p=0.013$ ). The landing angle showed a significant reduction for TM locomotion (-9% walk, -20% run;  $p<0.046$ ). A significant reduction on  $\Delta E_{kf}$  was found for walking (-6%;  $p=0.012$ ) and running (-9%;  $p<0.001$ ), whereas  $\Delta E_m$  showed only a significant reduction for running (-9%;  $p=0.001$ ) but not for walking ( $p=0.644$ ).  $\Delta E_{kv}$  and  $\Delta E_p$  were not significantly altered ( $p>0.28$ ). EMG amplitude showed no significant effect for walking ( $p>0.123$ ) whereas a reduction during the contact phase of TM running ( $p<0.019$ ). Especially TA, BF, SO, GM showed a reduction between 7-11% on the TM.

**Discussion/Conclusion:**

TM walking and running showed a reduction in  $\Delta E_{kf}$  (6% and 9%, respectively) compared to OG, which can be related to a more vertical landing angle for TM locomotion. The total mechanical energy variation ( $\Delta E_m$ ) and the EMG amplitude were reduced for TM versus OG running, but no difference was found for walking in both conditions. Changes in TA appear to be related to the reduction in heel-toe delay in TM running [cf. 3], and changes in BF, SO, and GM appear to be related to the reduction in forward braking-propulsion (cf.  $\Delta E_{kf}$ ) during the contact phase of TM running [4]. These results imply that the variation of the total mechanical energy  $\Delta E_m$  is comparable for TM and OG walking. Whereas, TM running is associated with lower  $\Delta E_m$  and a lower muscle activity, therefore TM running requires lower work expenditure [cf. 1] than when running at the same speed OG.

**References:**

1. Cavagna AG, The sources of external work in level walking and running. *J Physiol* 262, 1976
2. Staudenmann D, Effects of EMG processing on biomechanical models of muscle joint systems: sensitivity of trunk muscle moments, spinal forces, and stability. *J Biomech* 40, 2007
3. Nigg BM, A kinematic comparison of overground and treadmill running. *Med Sci Sports Exerc* 27, 1995
4. Hamner SR, Muscle contributions to propulsion and support during running. *J Biomech* 43, 2010

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Skill level dependent, automatically selected concurrent feedback accelerates robot-assisted motor learning

**Authors:** Wolf P<sup>1</sup>, Rauter G<sup>1</sup>, Sigrist R<sup>1</sup>, Gerig N<sup>1</sup>, Riener R<sup>1</sup>

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### Abstract:

#### Introduction:

Experienced human trainers are capable to adapt their level of support to the needs of the learner, i.e., to provide the currently most effective feedback. In robot-assisted rehabilitation, haptic guidance controllers have been presented that automatically adapt their level of support to the needs of the patient. However, if in robot-assisted training a selection of feedback strategies is available - addressing also different modalities - still the human is in charge to switch between the feedback strategies. Thus, success of robot-assisted training is very much dependent on the trainer's ability to select the most appropriate feedback. However, the trainers might have limited knowledge of the potential of each available feedback as well as of the current needs of the learner as observing all important biomechanical variables at the same time is challenging. To overcome these limitations, we introduce a virtual trainer evaluating the current rowing performance of non-rowers online and selecting the most appropriate concurrent feedback strategy objectively.

#### Methods:

Sixteen non-rowers were recruited, randomly assigned to either the virtual trainer or control group, and asked to learn a reference oar movement in trunk-arm rowing on a high-fidelity rowing simulator (Rauter et al., accepted). Subjects trained on two days including five 180s lasting trials with feedback each followed by a 60s lasting non-feedback trial. On a third day, another non-feedback trial was measured (similar protocol as in Sigrist et al., 2013). Subjects of the virtual trainer group received automatically selected, individualized feedback. Therefore, in the non-feedback trials, the most dominant error out of five errors (four spatial errors and one velocity error) was determined online. Thereafter, in the subsequent training with feedback, a feedback strategy was provided which has been shown in pilot studies to be appropriate to reduce this specific error. The resulting individual feedback protocol of each subject of the virtual trainer was also presented to one subject of the control group. Consequently, the control group was provided with the same feedback as the virtual trainer group, however, it did not necessarily address the currently most dominant error of a subject.

#### Results:

In comparison to the control group, subjects of the virtual trainer group performed significantly better from one non-feedback trial to the next one, i.e. short term learning was improved by individualized feedback. In addition, the virtual trainer group demonstrated significant long-term learning already after the first day, while the control group needed the second training day to demonstrate learning.

#### Discussion/Conclusion:

One of the largest potentials of robot-assisted training has been explored for the very first time: Continuously monitored data has been used to switch between available concurrent feedback strategies during a training session. The presented virtual trainer was able to accelerate motor learning when compared to unsupervised provision of concurrent feedback. Therewith, a basis is given to explore further approaches of automatic, individualized robot-assisted training in sports and to transfer them to rehabilitation.

#### References:

- Rauter G, Sigrist R, Koch C, Crivelli F, van Raaij M, Riener R, Wolf P (2013) Transfer of complex skill learning from virtual to real rowing. PLOS ONE, accepted.
- Sigrist R, Rauter G, Riener R, Wolf P (2013) Terminal feedback outperforms concurrent visual, auditory, and haptic feedback in learning a complex rowing-type task. J Motor Behavior 45:455-472.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

L'entraînement par intervalle à haut intensité sur tapis roulant à pression positive du bas du corps améliore la performance en course à pied.

**Authors:** Gojanovic B<sup>1,2</sup>, Cutti P<sup>1</sup>, Shultz R<sup>1</sup> Matheson GO<sup>1</sup>

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<sup>2</sup> Médecine du Sport, Département de l'Appareil Locomoteur (DAL), CHUV et Université de Lausanne

### Abstract:

#### Introduction:

L'entraînement par intervalles (HIIT) est classiquement utilisé pour améliorer divers paramètres physiologiques et la performance. Un nouveau tapis roulant permettant de diminuer artificiellement le poids corporel (PC) en maintenant la gestuelle de course (*AlterG antigravity treadmill*) permet d'augmenter la vitesse de course aux intensités maximales (Gojanovic, 2012), fournissant potentiellement un stimulus nouveau par usage de la survitesse. Cette étude randomisée vise à montrer si un entraînement HIIT en survitesse à 90% du poids corporel peut améliorer la performance.

#### Methods:

12 coureurs (35 ± 8 ans) de bon niveau ont été randomisés en 2 groupes, tapis roulant classique (CON) et tapis AlterG à 90% du PC (AG). 4 semaines d'entraînement (8 séances) à la vitesse maximale aérobie ( $vVO_2\max$ ), avec 4-5 intervalles de 60% le temps de soutien de  $vVO_2\max$  ( $T_{lim}$ ), récupération durant la moitié de ce temps (30%  $T_{lim}$ ). La performance a été mesurée sur piste (2 miles) et par un test de  $VO_2\max$  (effectué sur les tapis respectifs) et de rendement de course.

#### Results:

La  $vVO_2\max$  de départ est plus élevée chez AG, comme prévu par le protocole (19.7 ± 0.8 vs 17.7 ± 1.6 km·h<sup>-1</sup>). Les 2 groupes améliorent la performance sur piste (3218 m, 2 miles) de manière similaire (-16.4 et -15.1 s pour CON et AG,  $p < 0.01$ ), et leur vitesse au seuil anaérobie ( $p < 0.05$ ). Le groupe AG augmente sa  $vVO_2\max$  et  $T_{lim}$ . La  $VO_2\max$  et le rendement de course sont inchangés dans les 2 groupes, seule la fréquence cardiaque sous-maximale diminue dans les 2 groupes ( $p < 0.01$ ). 1 coureur CON a abandonné pour douleur fémoro-patellaire apparue en cours de protocole.

#### Discussion/Conclusion:

L'entraînement HIIT améliore la performance sur piste et la fréquence cardiaque sous-maximale, tant sur tapis roulant classique que sur AlterG à 90% du PC. AG permet des améliorations de performance au moins similaires au tapis roulant classique, avec potentiellement une meilleure tolérance et une baisse du risque de blessures lors de ce type de séances très exigeantes musculairement. Toutefois une adaptation sur AG est probable au vu des augmentations importantes de  $T_{lim}$  et  $vVO_2\max$  mesurées après l'entraînement sur ce tapis.

#### References:

Gojanovic, B., Cutti, P., Shultz, R., Matheson, G.O. (2012) Maximal physiologic and temporal-spatial parameters during reduced-gravity treadmill testing. *Med Sci Sports Exe*, 44(10), 1935-41.

## 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg

### Title:

**Acute effects of a single session of high-intensity interval training on standing balance performance, muscle activity and balance recovery in young adults and seniors**

**Authors:** L. Donath<sup>1</sup>, E. Kurz<sup>2</sup>, R. Roth<sup>1</sup>, S. Meister<sup>1</sup>, H. Hanssen<sup>1</sup>, L. Zahner<sup>1</sup>, A. Schmidt-Trucksäss<sup>1</sup>, O. Faude<sup>1</sup>

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### Abstract:

#### Introduction:

Compared to moderate endurance training, high intensity interval training (HIIT) superiorly increase cardiorespiratory function also in seniors (1, 2). Studies investigating acute effects of intense exercise on neuromuscular performance in terms of fall-risk in different age-groups are scarce to date (3). Thus, the present study aimed at investigating the acute effects of a single HIIT session on standing balance performance, muscle activity and balance recovery in seniors compared to young adults.

#### Methods:

Twenty healthy seniors (age: 70 (SD: 4) y; BMI: 25.0 (3.6) kg/m<sup>2</sup>; VO<sub>2max</sub>: 30.2 (6.1) mL/min/kg) and twenty young adults (age: 27 (SD: 3) y; BMI: 22.4 (2.2) kg/m<sup>2</sup>; VO<sub>2max</sub>: 46.6 (7.2) mL/min/kg) were examined on three days. After treadmill testing to evaluate maximal heart rate (HR<sub>max</sub>, day 1), either 4 × 4 HIIT at 90% of HR<sub>max</sub> or a control condition was randomly performed (days 2 and 3). Balance performance (postural sway within 10 s) was assessed during single limb stance with eyes opened (SLEO) and double limb stance with closed eyes (DLEC). Surface electromyography (SEMG) was measured for the soleus (SOL), medial gastrocnemius (MG), tibialis anterior (TA) and peroneus longus (PL) muscles at the dominant leg. All measures were collected before, immediately after, 10', 30' and 45' after the HIIT and control condition.

#### Results:

Significant condition × time interactions were found for both groups during SLEO (adults: p<0.001, η<sub>p</sub><sup>2</sup>= 0.31; seniors: p=0.02, η<sub>p</sub><sup>2</sup>= 0.18) but only for seniors during DLEC (p=0.04, η<sub>p</sub><sup>2</sup>= 0.16). Compared to the control condition, SLEO resulted in significant increases of sway only immediately after HIIT for both groups (adults: p<0.001, Δ= +25% sway; seniors: p=0.007, Δ= +15% sway). Increased sway during DLEC was only found for seniors immediately and 10' after HIIT (post: p=0.003, Δ= +14% sway, 10' post: p=0.004, Δ= +18% sway). TA and SOL muscle activation was altered in both groups, mostly pronounced immediately after HIIT.

#### Discussion/Conclusion:

A short term deterioration of standing balance performance with a potentially increased risk of falling, particularly in seniors, has been observed in both groups upon a single HIIT session. Balance performance returned to baseline level within approx. 10 minutes after exercise cessation during SLEO. During DLEC, seniors needed 30 minutes to achieve baseline levels of balance performance.

#### References:

1. Wisloff U., Stoylen A., Loennechen J.P., Bruvold M., Rognum O., Haram P.M., Tjonna A.E., Helgerud J., Slordahl S.A., Lee S.J., Videm V., Bye A., Smith G.L., Najjar S.M., Ellingsen O. & Skjaerpe T. (2007). Superior cardiovascular effect of aerobic interval training versus moderate continuous training in heart failure patients: a randomized study. *Circulation* 115:3086-3094.
2. Nemoto K., Genno H., Masuki S., Okazaki K. & Nose H (2007). Effects of high-intensity interval walking training on physical fitness and blood pressure in middle-aged and older people. *Mayo Clin Proc* 82:803-811.
3. Donath L., Zahner L., Roth R., Fricker L., Cordes M., Hanssen H., Schmidt-Trucksäss A. & Faude O. (2013) Balance and gait performance after maximal and submaximal endurance exercise in seniors: is there a higher fall-risk? *Eur J Appl Physiol* 113:661-669.

## Abstract 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg

### Title:

Balance and Pilates training in community-dwelling seniors: a randomized-controlled trial

**Authors:** Faude O, Donath L, Hürlimann C, Walker S, Zahner L, Roth R

Department of Sport, Exercise and Health, University of Basel

### Abstract:

#### Introduction:

Aging is associated with functional, neural and muscular deteriorations resulting in an increased fall risk. Pilates exercise training, particularly focusing on core stability, is considered a promising means to promote balance and functional performance in seniors and, thus, to improve fall risk factors (Granacher, Gollhofer, Hortobágyi, Kressig, Muehlbauer, 2013). The present study aimed to evaluate the effects of a traditional balance vs. Pilates training on postural control and core strength in community-dwelling elderly.

#### Methods:

Forty-eight healthy seniors (75% women) were stratified to either a balance training (BT, N=16, 69.1 (SD 5.8) y, 1.69 (0.07) m, 68.7 (13.1) kg), a Pilates training (PT, N=17, 70.8 (6.5) y, 1.66 (0.08) m, 67.8 (10.3) kg) or a control group (CON, N=15, 69.2 (6.1) y, 1.67 (0.07) m, 69.9 (10.6) kg). BT performed traditional neuromuscular balance training while PT conducted Pilates exercises for 8 weeks (two sessions (60 min) per week, attendance 91.5 (8.1) %). Before and after the intervention, static balance performance (center-of-pressure path length displacement) during single leg stance and balancing after a perturbation while kneeling, the Y-Balance test to assess dynamic balance, dynamic trunk flexion (ACSM curl-up test) as well as isometric trunk flexion (time to hold curl-up position) and extension (mod. Sorensen test) were measured.

#### Results:

Physical activity was not significantly different between groups during the intervention ( $p = 0.55$ ). No practically relevant between-groups effect was observed for PT compared to CON (all effect sizes ( $d$ )  $< 0.25$ ). BT showed likely substantially positive effects for Y-Balance score (right leg, +11.6% [90% CI 2.8; 21.0],  $d = 0.68$ ; left leg, +8.4% [0.9; 16.4],  $d = 0.56$ ), trunk extension (+18.0% [-2.7; 43.1],  $d = 0.68$ ) and single leg stance (right leg, +39.0% [0.3; 62.6],  $d = 0.61$ ; left leg, +11.2% [1.9; 19.7],  $d = 0.38$ ) compared to CON. BT exceeded also PT substantially for Y-Balance score (right leg, +7.9% [0.6; 15.8],  $d = 0.48$ ; left leg, +10.0% [-1.6; 22.9],  $d = 0.75$ ) as well as single leg stance (right leg, +15.0% [2.3; 26.1],  $d = 0.61$ ; left leg, +14.7% [4.1; 24.0],  $d = 0.67$ ).

#### Discussion/Conclusion:

We conclude that Pilates exercise training did not result in relevant adaptations in core strength and balance performance while traditional balance training showed substantially positive effects mainly in balance measures but also in trunk extension strength.

#### Reference:

Granacher, U., Gollhofer, A., Hortobágyi, T., Kressig, R.W., Muehlbauer, T. (2013). The importance of trunk muscle strength for balance, functional performance, and fall prevention in seniors: a systematic review. *Sports Medicine*, 43(7), 627-41.

**Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg**

**Title:**

Balancing on a slackline: 8-year-olds vs. adults

**Authors:** Schärli A M<sup>1</sup>, Keller M<sup>2</sup>, Lorenzetti S<sup>3</sup>, Murer K<sup>2</sup>, van de Langenberg R<sup>2</sup>.

<sup>1</sup>Institut für Sportwissenschaft, Universität Bern, Schweiz

<sup>2</sup>Institut für Bewegungswissenschaften und Sport, ETH Zürich, Schweiz

<sup>3</sup>Institut für Biomechanik, ETH Zürich, Schweiz

**Abstract:**

**Introduction:**

Children are less stable than adults during static upright stance (e.g., Schärli, van de Langenberg, Murer, & Müller, 2012; Shumway-Cook & Woollacott, 1985). We investigated whether the same holds true for a task that was novel for both children and adults and highly dynamic: single-legged stance on a slackline.

**Methods:**

We compared 8-year-olds (n=20) with young adults (n=10) and assessed the following outcome measures: time on the slackline, stability on the slackline (calculated from slackline reaction force), gaze movement (around a visual anchor point), head-in-space rotation and translation, trunk-in-space rotation, and head-on-trunk rotation. 8-year-olds and adults were compared using Mann-Whitney *U* tests for the above described outcome measures.

**Results:**

8-year-olds fell off the slackline quicker and were generally less stable on the slackline than adults. 8-year-olds also showed more head-in-space rotation and translation, and more gaze variability around a visual anchor point they were instructed to fixate. Trunk-in-space and head-on-trunk rotation did not differ between groups.

**Discussion/Conclusion:**

The results imply that the lower postural stability of 8-year-olds compared to adults – as found in simple upright stance – holds true for dynamic, novel tasks in which adults lack the advantage of more practice. They also suggest that the lack of head and gaze stability constitutes an important limiting factor in children's ability to master such tasks.

**References:**

- Schärli, A. M., van de Langenberg, R., Murer, K., & Müller, R. M. (2012). The influence of gaze behaviour on postural control from early childhood into adulthood. *Gait & Posture*, 36(1), 1-10.
- Shumway-Cook, A., & Woollacott, M. H. (1985). The growth of stability: postural control from a development perspective. *J Mot Behav*, 17(2), 131-147.

## Abstractvorlage 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg

### Title:

Unfallprävention im Schneesport: eine Erhebung zum Unfallgeschehen

**Authors:** Bianchi G<sup>1</sup>, Brügger O<sup>1</sup>.

<sup>1</sup>bfu – Beratungsstelle für Unfallverhütung, Bern, Schweiz

### Abstract:

#### Introduction:

Skifahren und Snowboarden sind beliebte Sportarten in der Schweiz und werden jedes Jahr von über zwei Millionen Personen der Schweizer Wohnbevölkerung ausgeübt (Lamprecht, Fischer & Stamm, 2008a,b). Der positive Einfluss von regelmässiger Bewegung und Sport auf die Gesundheit ist heutzutage allgemein bekannt (Martin-Diener, Brügger & Martin, 2010). Doch jedes Jahr verletzen sich im Schneesport durchschnittlich 66'000 Ski- und Snowboardfahrer (bfu, 2013). Um diese Unfälle zu verhindern sind detaillierte Informationen zum Unfallgeschehen notwendig. Die Statistik der «Verletzentransporte im Schneesport» der bfu – Beratungsstelle für Unfallverhütung liefert dabei wertvolle Inputs.

#### Methods:

Seit der Wintersaison 1989/90 erhebt die bfu in Zusammenarbeit mit Seilbahnen Schweiz SBS Daten von Schneesportunfällen. Die Rettungsdienste der Seilbahnen erfassen die Daten jedes Unfalls in ihrem Schneesportgebiet mit einem Unfallprotokoll. Seit der Saison 2009/2010 steht den Seilbahnen ein Online-Erfassungssystem zur Verfügung. Die Anonymität der Seilbahnunternehmen und der verletzten Personen ist dabei sichergestellt. Die bfu wertet schliesslich die erhobenen Daten mit SPSS aus.

#### Results:

Die Datenerhebung geht bis ins Jahr 1989/90 zurück und liefert daher einen guten Überblick über die Entwicklung des Sportartenanteils an den Unfällen. Dabei wird ersichtlich, dass der Anteil der verletzten Snowboarder im Verlaufe der 90er Jahre zugenommen, in den letzten Jahren jedoch wieder abgenommen hat. Die Daten enthalten zudem detaillierte Informationen zu den Unfällen von Kindern, Senioren, ausländischen Gästen, dem Unfallort und den Umständen des Unfalls, welche für die Ergänzung anderer vorhandener Statistiken im Schneesport von grosser Bedeutung sind.

#### Discussion/Conclusion:

Die Ergebnisse der Statistik «Verletzentransporte im Schneesport» dienen als Grundlage für die Themensetzung, Interventionsplanung und Evaluation von Massnahmen in der Präventionsarbeit. Die Statistik kann keine Aussagen zur absoluten Anzahl verletzter Schneesportler machen, da die Anzahl der registrierten Verletzentransporte von der Beteiligung der Seilbahnen an der Erfassung abhängig ist. Zudem sind Verletzungen der unteren Extremitäten, schwere Unfälle und Unfälle ausländischer Gäste eher überrepräsentiert. Um den Nutzen dieser wertvollen Datenerhebung für die Prävention noch zu erhöhen, sollen mit Hilfe des Unfallerfassungssystems mittelfristig die erfassten Unfälle eines Schneesportgebietes visualisiert werden. Dadurch können Unfallschwerpunkte im Pistensystem aufgedeckt und mit geeigneten Massnahmen entschärft werden.

#### References:

bfu - Beratungsstelle für Unfallverhütung. (2013). STATUS 2013: Statistik der Nichtberufsunfälle und des Sicherheitsniveaus in der Schweiz. Bern: bfu.

Martin-Diener E, Brügger O, Martin B. (2010). Physical Activity Promotion and Injury Prevention. Relationship in different population groups. Bern: bfu - Beratungsstelle für Unfallverhütung. bfu-Report 64.

Lamprecht M, Fischer A, Stamm H. (2008b). Sport Schweiz 2008: Das Sportverhalten der Schweizer Bevölkerung. Magglingen: Bundesamt für Sport BASPO.

Lamprecht M, Fischer A, Stamm H. (2008a). Sport Schweiz 2008: Kinder- und Jugendbericht. Magglingen: Bundesamt für Sport BASPO.

**Fachbereich**

**Sozialwissenschaften**



## Abstractvorlage 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg

### Title:

Sportmotorische Entwicklungsstudie im Schulumfeld

**Authors:** Krebs A<sup>1</sup>, Siegenthaler J<sup>1</sup>, Joss F<sup>1</sup>, Murer K<sup>1</sup>, Tomatis L<sup>1</sup>.

<sup>1</sup>Institut für Bewegungswissenschaften und Sport, ETH Zürich, Schweiz

### Abstract:

#### Einleitung:

Als Basis für zielgerichtete Interventionen ist eine verlässliche Diagnose nötig. Für die Erfassung der motorischen Fähigkeiten existieren international verschiedene standardisierte motorische Tests (Bös 2009), welche auch in der Schweiz verwendet werden, z.B. in den „Sportmotorischen Bestandesaufnahmen“ (SMBA) bei Erstklässlern. Es bestehen international Normwerte, die aber nur beschränkt auf die Schweiz übertragen werden können. Die Sportmotorische Entwicklungsstudie (SME) leistet einen Beitrag, diese Lücke zu füllen. Zudem wird im Längsschnitt überprüft, welche Prognosen bei Tests von 7-jährigen Kindern zulässig sind. Weiter werden Einflussfaktoren (Aktivität, Sozialstatus, etc.) auf die Leistungsfähigkeit identifiziert und quantifiziert.

#### Methoden:

Die SME Winterthur 2008-2013 setzt sich aus sechs jährlichen Querschnittserhebungen eines Schuljahrgangs zusammen. 1117 Kinder wurden einbezogen, von 484 Kindern liegen nach sechs Jahren vollständige Längsschnittdaten vor. Alle Klassen wurden im Rahmen einer Sportstunde in der Schulturnhalle getestet. Verwendet wurde die Testbatterie der SMBA, die aus fünf Aufgaben besteht: Seitliches Hin- und Herspringen (KTK); Arm-Tapping (EUROFIT); Standweitsprung (EUROFIT); 20m-Sprint (AST 6-11); Shuttle Run (EUROFIT). In der dritten und der sechsten Klasse wurde unter anderem ein Aktivitätsfragebogen eingesetzt.

#### Ergebnisse:

Es besteht bei allen sechs Testterminen kein Zusammenhang zwischen dem Testalter und der motorischen Leistungsfähigkeit der Kinder ( $r=0.01-0.18$ ). Die älteren Kinder schneiden im Vergleich mit altersbezogenen Normwerten schlechter ab als die jüngeren in der Klasse. Das Körpergewicht (BMI) korreliert nicht mit den gemessenen Leistungen der Erstklässler in den fünf Tests ( $r=0.06-0.27$ ), der Zusammenhang steigt aber vor allem beim Shuttle Run bis in die 4. Klasse stetig an (von  $r=0.27$  auf  $0.52$ ) und stabilisiert sich bis zur 6. Klasse ( $r=0.47$ ). Der Umfang der Alltagsaktivität zeigt nur einen geringen Zusammenhang mit der sportmotorischen Leistungsfähigkeit ( $r=0.08-0.21$ ), die Vereinsmitglieder sind in allen Aufgaben stärker als die Nichtmitglieder. Aufgrund der in der ersten Klasse gemessenen Leistungen lassen sich die Resultate in der sechsten Klasse im Tapping gering ( $r=0.39$ ), in den anderen Tests mittelmässig vorhersagen ( $r=0.53-0.62$ ). Stabiler ist die Prognose des BMI-Wertes ( $r=0.82$ ). Die Leistungsfortschritte sind in allen Tests negativ korreliert mit der Ausgangsleistung.

#### Diskussion:

Altersbezogene Normwerte können nur bedingt auf Schulklassen übertragen werden. Das Körpergewicht spielt mit zunehmendem Alter eine grössere Rolle, was frühzeitige Interventionen rechtfertigt, zumal sich beim Körpergewicht eine hohe Stabilität über die Zeit zeigt. Kinder mit den tiefsten Ausgangswerten in der ersten Klasse verbessern sich mehr als Kinder mit besseren Startleistungen. Der mittelhohe Zusammenhang zwischen den gemessenen Leistungen in der ersten und der sechsten Klasse zeigt, dass bei der sportmotorischen Entwicklung viele Faktoren zu berücksichtigen sind, deren Einfluss noch genauer zu untersuchen ist.

#### References:

- Bös, K, Worth, A, Opper, E, Oberger J, Woll, A (2009). Motorik-Modul: Eine Studie zur motorischen Leistungsfähigkeit und körperlich-sportlichen Aktivität von Kindern und Jugendlichen in Deutschland. Abschlussbericht zum Forschungsprojekt. Baden-Baden: Nomos Verlag.
- Krombholz H (2006). Physical performance in relation to age, sex, birth order, social class, and sports activities of preschool children. *Percept Mot Skills*. 102: 477-484

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### **Titel:**

Vergleichende sportmotorische Untersuchung von Kindern in Deutschland und der Schweiz in Größe, Gewicht und Standweitsprung

**Autoren:** Wittelsberger, R<sup>1</sup>, Krebs, A<sup>2</sup>, Reiner, M<sup>1</sup>, Tomatis, L<sup>2</sup>, Murer, K<sup>2</sup>, Schlenker, L<sup>1</sup>, Woll, A<sup>1</sup>, Bös, K<sup>1</sup>.

<sup>1</sup>Institut für Sport und Sportwissenschaft, Karlsruher Institut für Technologie, Deutschland

<sup>2</sup>Institut für Bewegungswissenschaften und Sport, Eidgenössische Technische Hochschule Zürich, Schweiz

### **Abstract:**

#### **Einführung:**

Die sportmotorische Untersuchung von Kindern zur Ermittlung der körperlichen Leistungsfähigkeit ist ein wichtiger Aspekt für die Überprüfung der gesunden Entwicklung der Kinder. In Deutschland liegen durch das Motorik-Modul (MoMo) repräsentative Normwerte zur motorischen Leistungsfähigkeit von Kindern- und Jugendlichen vor. In der Schweiz liegen für die Stadt Winterthur große Datenmengen aus der längsschnittlich angelegten sportmotorischen Entwicklungsstudie (SME) vor. Ziel dieses Beitrages ist der Vergleich der motorischen Leistungsfähigkeit der deutschen Kinder anhand der Normwerte des Motorik-Moduls mit den Ergebnissen einer Längsschnittuntersuchung aus der Schweiz in der Testaufgabe Standweitsprung.

#### **Methoden:**

Im Rahmen des Motorik-Moduls (MoMo) wurde die motorische Leistungsfähigkeit von insgesamt 4.529 Kindern und Jugendlichen in Deutschland mit Hilfe eines standardisierten Instrumentariums aus verschiedenen sportmotorischen und apparativen Tests untersucht (Mädchen 48,9%; Jungen 51,5%). Mit Hilfe der gewonnenen Daten wurden bundesweit repräsentative Normwerte zur Motorik erstellt. Die darin enthaltenen Testaufgaben sind unter anderen auch der Standweitsprung.

In der Schweiz wurde in der Stadt Winterthur in einer Längsschnittuntersuchung eine vollständige Schulgeneration von 2008 bis 2013 mit einer fünf Testaufgaben umfassenden Testbatterie untersucht (N= 484, Mädchen 52,3%, Jungen 47,7%).

Eine bei beiden Stichproben durchgeführte Testaufgabe ist der Standweitsprung, wobei in der Schweiz die Landung auf einer 7cm dicken Matte erfolgt.

#### **Ergebnisse:**

Die Schweizer Daten sind vergleichbar zu den deutschen Normwerten bezüglich Größe und Gewicht. In der Testaufgabe Standweitsprung zeigen sich bei den 10 – 11 Jährigen und den 11-12 Jährigen Jungen signifikante Unterschiede (10-11 Jährige:  $t = -2,471$ ,  $df = 228$ ,  $p = 0.014$ / 11 – 12 Jährige:  $t = -4,165$ ,  $df = 230$ ,  $p = 0.00$ ). In diesen zwei Altersgruppen erreichen die Winterthurer Kinder die deutschen Normwerte nicht.

#### **Diskussion:**

Die Ergebnisse zeigen für den Standweitsprung, dass die Leistungen der Schweizer Kinder somit -bis auf die 10 – 11 Jährigen und 11 - 12 Jährigen Jungen- den deutschen Normwerten entsprechen.

Die vorliegenden Ergebnisse weisen auf einen vergleichbaren Entwicklungsverlauf der Schweizer Kinder in Bezug auf die deutschen Normwerte hin. Weitere Untersuchungen und Vergleiche in anderen Testaufgaben stehen noch aus.

#### **Referenzen:**

Bös, K, Worth, A, Opper, E, Oberger J, Woll, A (2009). Motorik-Modul: Eine Studie zur motorischen Leistungsfähigkeit und körperlich-sportlichen Aktivität von Kindern und Jugendlichen in Deutschland. Abschlussbericht zum Forschungsprojekt. Baden-Baden: Nomos Verlag.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Erfassung motorischer Basiskompetenzen im Sportunterricht – Ergebnisse der IMPEQT- und MOBAK-7 Studie

**Authors:** Herrmann C<sup>1</sup>, Leyener S<sup>1</sup>, Pühse U<sup>1</sup>, Seelig, H<sup>1</sup>, & Gerlach, E<sup>1,2</sup>

<sup>1</sup> Universität Basel, Schweiz

<sup>2</sup> Universität Potsdam, Deutschland

### Abstract:

**Introduction:** Im Rahmen der nationalen „Evaluationskultur im Bildungswesen“ (EDK, 2008) wird allen Schulfächern die Frage gestellt, welche fachspezifischen Kompetenzen aufgebaut werden. Zentrales Bildungsziel des Schulsports ist u. a. die Vermittlung von motorischen Basisqualifikationen, welche die SchülerInnen zu einer Teilhabe an der Sport- und Bewegungskultur befähigt.

**Methods:** Das MOBAQ-Testinstrument (vgl. Kurz, Fritz & Tscherpel, 2008) zur Erfassung dieser motorischen Basisqualifikationen lässt sich in Kompetenzen beschreiben, ist in Form von empirisch prüfbareren Testaufgaben einsetzbar und erfasst normativ festgelegte Mindeststandards. Die zentralen Fragen lauten: (1) Welche Struktur bilden diese Testaufgaben ab? (2) Ist die Struktur des MOBAQ-Testinstruments über die Zeit stabil? (3) Ist diese Struktur auch in jüngeren Altersstufen existent? Im Zuge der von der ESK geförderten IMPEQT-Studie wurden 890 bzw. 837 SchülerInnen (Alter t1: M = 13.2 Jahre) zu zwei Messzeitpunkten mittels zwölf ordinal skalierten MOBAQ-Testaufgaben in der 7. und 8. Jahrgangsstufe erfasst. Darauf aufbauend wurden zehn MOBAQ-Testaufgaben für die 1. Jahrgangsstufe entwickelt und in der MOBAK-7 Pilotstudie mit 317 Schüler/innen (Alter: 7.0 Jahre) durchgeführt. Aufgrund der Skalierung der Testaufgaben wurden die explorativen, konfirmatorischen und autoregressiven Strukturgleichungsmodelle in Mplus mittels WLSM-Schätzer berechnet: (1) Mit der IMPEQT-Stichprobe der Siebtklässler wurden explorative und konfirmatorische Faktorenanalysen durchgeführt, um die Struktur der Testaufgaben abzubilden und die psychometrischen Qualitätskriterien zu kontrollieren. (2) In einem autoregressiven Strukturgleichungsmodell wurde die zeitliche Invarianz über den einjährigen IMPEQT-Längsschnitt überprüft. (3) Abschliessend wurde mittels konfirmatorischer Faktorenanalyse die explorierte Faktorenstruktur in der MOBAK-7 Stichprobe der Erstklässler geprüft.

**Results:** (1) Nach Ausschluss einer Testaufgabe zeigt die explorative Faktorenanalyse mit guten Modelfits (CFI = 1.00; RMSEA = .00; SRMR = 0.37) eine zweifaktorielle Struktur. Sieben Testaufgaben laden auf den ersten Faktor und beinhalten „Ganzkörperbewegungen“ (z.B. Hangeln, Hindernislauf), vier Testaufgaben laden auf den zweiten Faktor und beinhalten „Bewegungen mit dem Ball“ (z.B. Prellen, Passen). Eine Replikation dieser Struktur unter restriktiveren Bedingungen der konfirmatorischen Faktorenanalyse bestätigt diese (CFI = .98; TLI = .97; RMSEA = .030; WRMR = .87). (2) Das autoregressive Strukturgleichungsmodell mit faktorieller Invarianz erreicht eine sehr gute Passung auf die Längsschnittdaten (CFI = .98; TLI = .98; RMSEA = .021; WRMR = .97), woraus gefolgert werden kann, dass die Struktur der MOBAQ-Testitems nach einem Jahr in gleicher Form bestand haben. (3) Eine erste konfirmatorische Analyse der MOBAK-7 Stichprobe zeigt, dass die zweifaktorielle Struktur die Daten der Erstklässler zufriedenstellend abbildet (CFI = .88; TLI = .86; RMSEA = .042; WRMR = 1.09). Es kann daher davon ausgegangen werden kann, dass sich die Faktoren „Ganzkörperbewegungen“ und „Bewegungen mit den Ball“ bereits in der 1. Jahrgangsstufe differenzieren lassen.

**Discussion/Conclusion:** Die entwickelten Testbatterien zur Erfassung von motorischen Basisqualifikationen genügen weitestgehend den psychometrischen Testkriterien und sind damit ein geeignetes Instrument, um Effekte von Schulsport zu bestimmen. Folgend wird die MOBAK-7 Testbatterie weiter optimiert und mit Testbatterien zur Erfassung von motorischen Fähigkeiten in Beziehung gesetzt.

(ABSTRACT TRUNCATED)

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Der Leistungssport in der Schweiz. Momentaufnahme SPLISS-CH 2011

**Authors:** Kempf H.<sup>1</sup>, Weber A. Ch.<sup>1</sup>, Renaud A.<sup>1</sup> & Stopper M.<sup>1</sup>

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### Abstract:

#### Introduction:

Nationen messen sich auf dem olympischen Medaillenmarkt. In verschiedenen Ländern kann ein verstärktes Engagement des Staates im Spitzensport festgestellt werden (De Bosscher, Bingham, Shibli, Van Bottenburg, & De Knop, 2008; Digel, Burk, & Fahrner, 2006; Emrich & Güllich, 2005; Houlihan & Green, 2008). Dies gilt auch für die Schweiz. Ziel der SPLISS-CH 2011 Studie ist es, mit Hilfe eines Bestandskatalogs das Schweizer Leistungssportsystem zu erklären und durch den Befragungskatalog sowie den internationalen Vergleich gewisse Stärken und Schwächen zu identifizieren. Diese Studie kann den öffentlich-rechtlichen sowie den privatrechtlichen Entscheidungsträgern als Grundlage dienen um die Effizienz und Effektivität des Systems zu erhöhen.

#### Methods:

Die SPLISS-CH-2011-Studie baut auf dem Modell von De Bosscher et al. (2008) auf. Dieses basiert auf einem Input-Throughput-Output-Modell. Das Modell bildet die erfolgsrelevanten Bereiche eines nationalen Leistungssportsystems ab. Diese Bereiche wurden mit insgesamt 136 kritischen Erfolgsfaktoren evaluiert. Die Evaluation erfolgte anhand zwei Instrumente: ein Bestandskatalog (219 Hauptfragen) und ein Befragungskatalog (60–70 Fragen) für Athleten, Trainer und Leistungssportchefs. Zweiter wurde auf die Schweizer Gegebenheiten angepasst. Das Athleten-Sample basierte auf dem Besitz der Swiss Olympic Cards (2010), das Trainer-Sample auf den Swiss-Olympic-Card-Trainern (2010) und den Trainern der Nachwuchsförderstufe 2-3 (2010). Um den Bestandskatalog auszufüllen wurden Dokumente gesichtet und semistrukturierte Interviews mit 68 Experten durchgeführt. Zur Validierung der Resultate wurde eine nationale Begleitgruppe geschaffen und ein Validierungsworkshop mit Vertretern des Schweizer Sports durchgeführt.

#### Results:

Die Schweiz deckt ein Grossteil der definierten 137 Erfolgsfaktoren eines nationalen Leistungssportsystems ab. Das grösste Potential sehen die Athleten bei der «Finanziellen Unterstützung» und der «Talentförderung». Die Trainer erachten die «Finanzielle Unterstützung», die «Talentförderung» und die «(Spitzen-)Sportkultur» als besonders verbesserungsfähig. Das Inventar des Leistungssports, die Expertengespräche und schliesslich der internationale Vergleich lassen präzisere Aussagen zu den Verbesserungs-Potentialen zu. Diese wurden in 12 Punkten ausformuliert.

#### Discussion/Conclusion:

Die Schweiz macht vieles gut, einiges könnte besser sein. Zusammenfassend können folgende Empfehlungen abgegeben werden: «Finanzierung verbessern», «Dank Leistungssport Karriere stärken», «Attraktivität des Berufsfelds ‚Leistungssport‘ stärken» und «Dank Synergien Mehrwerte schaffen». Die erstmalige Datenerhebung in diesem Umfang hat Forschungslücken aufgezeigt, welche in Folgestudien geschlossen werden könnten.

#### References:

- De Bosscher, V., Bingham, J., Shibli, S., Van Bottenburg, M., & De Knop, P. (2008). *The global sporting arms race. An international comparative study on Sport Policy factors leading to international sporting success*. Oxford: Meyer & Meyer Sport.
- Digel, H., Burk, V., & Fahrner, M. (2006). *Die Organisation des Hochleistungssports. Ein internationaler Vergleich*. Schorndorf: Hofmann.
- Emrich, E., & Güllich, A. (2005). *Zur «Produktion» sportlichen Erfolges. Organisationsstrukturen, Förderbedingungen und Planungsannahmen in kritischer Analyse*. Köln: Sport & Buch Strauss.
- Houlihan, B., & Green, M. (2008). *Comparative Elite Sport Development. Systems, structure and public policy*. Oxford: Elsevier.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Le management de la performance des fédérations sportives nationales : état des lieux des recherches et perspectives pour les fédérations suisses

**Authors:** Bayle Emmanuel<sup>1</sup>

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### Abstract:

#### Introduction:

Les fédérations sportives sont au cœur de multiples enjeux dont est porteur le phénomène sportif organisé : éducation, santé, tourisme, événements, prestige national, développement durable (...). Dans la plupart des pays développés, elles font actuellement l'objet, comme d'autres associations (Langer, A. & Schröer, 2011), d'une forte professionnalisation, concernant notamment le nombre de leur personnel salariés. Par exemple, Lamprecht et al. (2012, 118) ont montré que 1300 personnes travaillent au sein des fédérations sportives suisses et que le nombre de personnes employées à plein temps a augmenté de 120 au cours des 6 dernières années. Les fédérations sportives nationales peuvent être qualifiées d'organisations hybrides (Bayle, 2007) qui doivent intégrer des logiques d'action a priori contradictoires (associative versus commerciale...) mais pourtant complémentaires pour leur développement. Dans ce contexte, leurs dirigeants et managers doivent gérer des paradoxes et contradictions. Comment alors analyser et comprendre les logiques de gouvernance, les pratiques de management et mesurer les performances (sportive, économique, sociale, voire sociétale) des organisations sportives. Cette problématique pose la question de la spécificité (principes, outils de gestion...) du management de la performance dans des organisations aux rationalités différentes de celles des entreprises.

#### Methods:

Les travaux portant sur le management de la performance appliqués aux organisations sportives en général et portant sur les fédérations sportives en particulier sont assez peu nombreux. La plupart des travaux précédents ayant porté soit sur les évolutions des structures organisationnelles, la professionnalisation et la compréhension des modalités du changement organisationnel (dans le sillage creusé par les travaux de Trevor Slack et ses collègues ; voir pour une synthèse Slack & Parent, 2006) soit sur la mesure de la performance des fédérations sportives (par exemple : Madella et al. 2005, Papadimitriou & Taylor, 2000 ; Winand et al. 2010). De nouveaux travaux de nature plus managériale ont progressivement émergé pour comprendre les capacités organisationnelles des associations sportives (Misenet & Doherty, 2009), les capacités stratégiques des comités nationaux olympiques (Robinson & Miskin, 2011). Des travaux de recherche dans le cadre du programme SPLISS ont proposé une analyse du management de la performance du sport d'élite (Sotiriadou & De Bosscher, 2013). La mise en relation des pratiques de management et la performance des fédérations sportives a également été étudiée implicitement par des études de cabinets de conseils mandatés par les institutions sportives pour moderniser le management des fédérations (Deloitte&Touch, 2003 pour les fédérations britanniques ; Crawford report, 2009 en Australie ; voir pour une présentation Robinson & Palmer, 2010). A partir de différentes recherches précédentes et du cadre d'analyse appliqué aux fédérations sportives françaises par Bayle et Robinson (2007) ainsi que d'une approche méthodologique systémique d'une fédération, la communication vise à présenter et illustrer les facteurs clés de succès du management de la performance des fédérations sportives suisses à partir d'une comparaison avec la France. Des entretiens d'experts (avec Swiss Olympic et l'OFSP) et une analyse documentaire (organigramme, éléments financiers...) ont été menés pour effectuer cette étude comparative avec une illustration à partir de trois fédérations de grande, de moyenne et de petite tailles.

### Results:

Six facteurs clés de succès (FCS) et quatre facteurs clés d'échec (FCE) du management de la performance (Bayle & Robinson, 2007) sont successivement étudiés. Les six FCS sont les suivants : les modalités de gouvernance, la qualité du maillage fédéral, la taille de la filière économique et la position occupée par la fédération, les formes et types de professionnalisation, la démarche de partenariats, la culture d'entreprise sportive associative et les quatre FCE sont les suivants : déficit des systèmes d'information, complexité des mécanismes incitatifs, absence de contrôle des acteurs, scléroses de gouvernance.

### Discussion/Conclusion:

Cette recherche permet de discuter les points communs et les points de différence entre les deux modèles et systèmes de management de la performance selon la taille des fédérations (grande, moyenne et petite). Des hypothèses sont proposées pour expliquer les différences mises à jour entre les deux pays et mieux comprendre les évolutions en cours dans le management de la performance des fédérations sportives nationales.

### References:

- Bayle E., Chappelet J-L., François A., Maltese L. (2011), *Sport et RSE. Vers un management responsable ?* Bruxelles : De Boeck Editions.
- Bayle E. (2007a), La recherche en management des organisations sportives : objet, champ, niveaux d'analyse et spécificités des pratiques de management, *Revue Internationale en Science du sport et de l'éducation physique*, N°75/1, Eds De Boeck, 59-81.
- Bayle, E. et Robinson, L. (2007b). A Framework for understanding the performance of national governing bodies of sport, *European Sport Management Quarterly*, 7(3), Taylor & Francis, 249-268
- Chappelet J-L. et Bayle E. (2004) *Performance and strategic management of olympic sport organizations*, Eds. Human Kinetics, 2004.
- Deloitte et Touche (GB) (2003). *Investing in change - high level review of the modernisation programme for governing bodies of sport*, july, London.
- Hinings C.R., Slack T. & Thibault L. (1991). Professionalism, structures and systems: The impact of professional staff on voluntary sport organisations. *International Review for Sociology of Sport*, 26, 33-44.
- Kikulis, L. M. (2000). Continuity and change in governance and decision making in national sport organizations: institutional explanations. *Journal of Sport Management*, 14, 293-320.
- Langer, A. & Schröer, A. (Eds.) (2011). *Professionalisierung im Nonprofit Management*. Wiesbaden: Springer VS.
- Lamprecht M., Fischer A., Stamm H. (2012) Die Schweizer sportvereine. Strukturen, leistungen, herausforderung, Zürich (<http://www.lisweb.ch>).
- Madella A., Bayle E. & J-L. Tome (2005). Performance measurement of sports national organisations in Europe: a comparative analysis between four national swimming federations. *European Journal of Sport Science*.
- Misener, K. & Doherty A., (2009) A Case Study of Organizational Capacity in Nonprofit Community Sport, *Journal of Sport Management*, 23, 457-482
- Papadimitriou D. & Taylor P. (2000). Organisational effectiveness of hellenic national sports organisations: a multiple constituency approach. *Sport Management Review*, 3, 23-46.
- Robinson L. Palmer D Eds. (2010), *Managing voluntary organisations*,
- Robinson, L., Minikin, B. (2011). Developing strategic capacity in Olympic sport organisations, *Sport, Business and Management: An International Journal*, Vol. 1 Iss: 3, 219 - 233
- Slack, T. & Parent, M. (2005). *Understanding sport organizations. The application of organization theory*. Champaign, IL: Human Kinetics.
- Slack, T. & Parent, M. (2006). *Understanding sport organizations. The application of organization theory*. Champaign, IL: Human Kinetics (2<sup>nd</sup> Edition).
- (ABSTRACT TRUNCATED)

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Sportvereine in der Schweiz und in Deutschland: Regionale und nationale Gemeinsamkeiten und Unterschiede.

**Authors:** Markus Lamprecht<sup>1</sup>, Adrian Fischer<sup>1</sup>, Hanspeter Stamm<sup>1</sup>, Christoph Breuer<sup>2</sup>, Svenja Feiler<sup>2</sup>, Pamela Wicker<sup>2</sup>

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### Abstract:

#### Introduction:

Sowohl in der Schweiz als auch in Deutschland sind die Sportvereine die wichtigsten Sportanbieter. Ihre Situation, Leistungen und Probleme sind in vielem vergleichbar, es gibt aber auch bemerkenswerte Unterschiede. Die Frage, wie sich diese Unterschiede genau darstellen und erklären lassen und wie sie sich auf die Situation und Probleme der Vereine auswirken, ist Teil eines gemeinsamen Forschungsprojektes. Im vorliegenden Beitrag sollen zudem auch die Unterschiede zwischen den Schweizer Sprachregionen in die Betrachtung einbezogen und die Frage geklärt werden, ob Deutschschweizer Vereine den Deutschen Vereinen ähnlicher sind als Vereine aus der West- und Südschweiz.

#### Methods:

Die Vergleiche beruhen auf grossen und repräsentativen Vereinsbefragungen, welche 2009/2010 in den beiden Ländern durchgeführt wurden. Im Rahmen des Deutschen Sportentwicklungsberichts befragte das Institut für Sportökonomie und Sportmanagement der Deutschen Sporthochschule Köln 19'345 Sportvereine. In der Schweiz wurden 6221 Sportvereine durch das Sportobservatorium befragt. Sowohl die Erhebungsmethode als auch der Fragebogen waren so aufeinander abgestimmt, dass differenzierte Vergleiche möglich sind. Im Beitrag sollen verschiedene Befunde dargestellt und interpretiert werden.

#### Results/Discussion/Conclusion:

Die Unterschiede beziehen sich einerseits auf die Vereinsgrösse und Vereinsstruktur sowie auf die Ausrichtung und die Angebote. In Deutschland sind die Sportvereine in der Regel grösser und es handelt sich häufiger um Mehrspartenvereine, während in der Schweiz der kleine Einspartenverein dominiert. Andererseits unterscheiden sich Deutsche und Schweizer Vereine auch bezüglich des Grads der Professionalisierung, der Finanzen und der Infrastrukturnutzung. Die Unterschiede zwischen den Sprachregionen in der Schweiz sind geringer als aufgrund der unterschiedlichen Sportaktivität erwartet werden kann. Insgesamt sind die regionalen Unterschiede geringer als die Unterschiede zwischen der Schweiz und Deutschland. Sie werden zudem von den Unterschieden zwischen den Sportarten überlagert, die deutlich ausgeprägter sind.

#### References:

Breuer, C. (Ed.) (2013): Sportverbände, Sportvereine und ausgewählte Sportarten: Weiterführende Analysen der Sportentwicklungsberichte. Köln: Strauss.

Lamprecht, M., Fischer A., & Stamm H.P. (2012): Die Schweizer Sportvereine: Strukturen, Leistungen, Herausforderungen. Zürich: Seismo.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

**Title:** Does the (structural) context matter? Analysing individual and structural factors of members' commitment to sports clubs

**Authors:** Schlesinger, Torsten,<sup>1</sup> Nagel, Siegfried.

<sup>1</sup>Institut für Sportwissenschaft, Universität Bern, Schweiz

### **Abstract:**

#### **Introduction:**

Over the last decades, Swiss sports clubs have lost their "monopoly" in the market for sports-related services and increasingly are in competition with other sports providers. For many sport clubs long-term membership cannot be seen as a matter of course. Current research on sports clubs in Switzerland – as well as for other European countries – confirms the increasing difficulties in achieving long-term member commitment. Looking at recent findings of the Swiss sport clubs report (Lamprecht, Fischer & Stamm, 2012), it can be noted, that a decrease in memberships does not equally affect all clubs. There are sports clubs – because of their specific situational and structural conditions – that have few problems with member fluctuation, while other clubs show considerable declines in membership. Therefore, a clear understanding of individual and structural factors that trigger and sustain member commitment would help sports clubs to tackle this problem more effectively. This situation poses the question: What are the individual and structural determinants that influence the tendency to continue or to quit the membership?

#### **Methods:**

Existing research has extensively investigated the drivers of members' commitment at an individual level. As commitment of members usually occurs within an organizational context, the characteristics of the organisation should be also considered. However, this context has been largely neglected in current research. This presentation addresses both the individual characteristics of members and the corresponding structural conditions of sports clubs resulting in a multi-level framework for the investigation of the factors of members' commitment in sports clubs. The multilevel analysis grant a adequate handling of hierarchically structured data (e.g., Hox, 2002). The influences of both the individual and context level on the stability of memberships are estimated in multi-level models based on a sample of n = 1,434 sport club members from 36 sports clubs.

#### **Results:**

Results of these multi-level analyses indicate that commitment of members is not just an outcome of individual characteristics, such as strong identification with the club, positively perceived communication and cooperation, satisfaction with sports clubs' offers, or voluntary engagement. It is also influenced by club-specific structural conditions: stable memberships are more probable in rural sports clubs, and in clubs that explicitly support sociability, whereas sporting-success oriented goals in clubs have a destabilizing effect.

#### **Discussion/Conclusion:**

The proposed multi-level framework and the multi-level analysis can open new perspectives for research concerning commitment of members to sports clubs and other topics and problems of sport organisation research, especially in assisting to understand individual behavior within organizational contexts.

#### **References:**

Hox, J. J. (2002). *Multilevel analysis: Techniques and applications*. Mahwah: Lawrence Erlbaum.  
Lamprecht, M., Fischer, A., & Stamm, H.-P. (2012). *Die Schweizer Sportvereine – Strukturen, Leistungen, Herausforderungen*. Zurich: Seismo.



## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Wer ist für Wirkungsanalysen im Schulsport zuständig?

**Authors:** Conzelmann Achim

### Abstract:

#### Introduction:

Die Nachfrage nach Evaluationsstudien und insbesondere auch nach Wirkungsanalysen für den Schulsport hat in den letzten Jahren erheblich zugenommen. Doch wer soll diese Wirkungsanalysen durchführen: die genuin für das Forschungsfeld Schulsport zuständige Sportpädagogik oder eher Fächer mit einer längeren Tradition in empirischen Forschungsmethoden? Im Rahmen des Beitrags wird diese Frage beispielhaft für das Problem des empirischen Nachweises schulsportlicher Wirkungen auf die Persönlichkeitsentwicklung diskutiert. Es geht somit um die Frage der Rollenaufteilung zwischen Sportpädagogik und Sportpsychologie, die aus der Perspektive der Sportpsychologie diskutiert wird.

#### Methods:

Einführend werden aktuelle, in der Literatur zu findende Einschätzungen zur Rollenverteilung zwischen den beiden Fächern gegeben. Im zweiten Schritt werden die disziplinären Charakteristika der (Sport-)Psychologie und sich daraus ergebenden methodologischen und methodischen Konsequenzen erläutert. Und schliesslich wird in Anlehnung an Prohl (2006) ein Vorschlag zur Rollenverteilung vorgelegt.

#### Results:

Das Fazit des Beitrags lautet, dass eine Kooperation zwischen Sportpädagogik und Sportpsychologie anzustreben ist, bei der die Stärken der beiden Kooperationspartner möglichst effizient und vorurteilsfrei eingebracht und nachgefragt werden. Dies erfordert allerdings von beiden Seiten eine bis anhin nicht immer anzutreffende *Gesprächsbereitschaft* bzw. *Gesprächsfähigkeit*. Beides, Gesprächsbereitschaft und -fähigkeit, setzt eine gewisse Kenntnis des Kooperationspartners voraus. Im diesem Sinne versteht sich der Beitrag als Brückenbauer zwischen den beiden Fächern und als Ausgangspunkt für weitere Diskussionen und Kooperationsbemühungen.

#### References:

Prohl, R. (2006). *Grundriss der Sportpädagogik* (2. Aufl.). Wiebelsheim: Limpert.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Effekte des Sportunterrichts auf die Kognition – welcher Sport wirkt weshalb wie?

**Authors:** Schmidt M.<sup>1</sup>, Jäger, K.<sup>2</sup>, Roebers, C.<sup>2</sup>, Conzelmann, A.

<sup>1</sup>Institut für Sportwissenschaft, Universität Bern, Schweiz

<sup>2</sup>Institut für Psychologie, Universität Bern, Schweiz

### Abstract:

#### Introduction:

Es gibt zunehmend Hinweise darauf, dass sportliche Aktivität nicht nur positive Effekte auf die körperliche Gesundheit, sondern auch auf die kognitive Leistung haben kann. Bisherige experimentelle Studien, die einen kausalen Zusammenhang zwischen diesen beiden Variablen nachweisen konnten, wurden jedoch vorwiegend mit Erwachsenen durchgeführt (Chang et al., 2012). Ob dieselben Effekte auch bei Kindern und Jugendlichen vorzufinden sind, kann mit Blick auf die mangelnde empirische Evidenz in dieser Altersgruppe (z.B. Hillman et al., 2008) kaum zufriedenstellend beantwortet werden. Will man zudem der Frage nach den zugrundeliegenden Wirkmechanismen nachgehen, sind Untersuchungsdesigns sinnvoll, die theoriegeleitet verschiedene Sportinterventionen mit unterschiedlichen Beanspruchungsmodalitäten kombinieren. So ist unter der Annahme der *cardiovascular fitness hypothesis* (Etnier et al., 2006) zur gezielten Förderung der kognitiven Leistungsfähigkeit ein systematisches Ausdauertraining sinnvoll, während theoretische Ansätze, die *neurophysiologische Korrelate* zur Erklärung des Zusammenhangs zwischen Sport und Kognition heranziehen (Diamond, 2000) eher kognitiv sowie koordinativ anspruchsvolle Sportangebote nahelegen würden. Daher geht der vorliegende Beitrag der Frage nach, ob spezifisch konzipierte langfristige Interventionen im Sportunterricht einen positiven Effekt auf die kognitive Leistungsfähigkeit von Primarschulkindern haben können.

#### Methods:

Im Rahmen der quasiexperimentellen Längsschnittstudie „Sport und Kognition“ (SpuK\_5.0) wurden insgesamt 250 Schülerinnen und Schüler von 16 fünften Klassen untersucht. Während knapp zwei Monaten absolvierten je vier Klassen während zwei Lektionen des obligatorischen Sportunterrichts entweder ein spielsportbezogenes EF-Training oder ein Ausdauertraining resp. ein kognitives oder kein spezifisches Training (Kontrollgruppe mit regulärem Sportunterricht). Durch die Konzeption dieser vier Experimentalbedingungen wurde sichergestellt, dass alle vier möglichen Kombinationen aus hoher resp. niedriger kognitiver und körperlicher Beanspruchung im Design repräsentiert sind.

#### Results & Discussion:

Im Beitrag werden erste Ergebnisse der SpuK\_5.0-Studie vorgestellt und vor dem Hintergrund aktueller theoretischer Annahmen zu den zugrundeliegenden Wirkmechanismen diskutiert. Damit sollten Anregungen entstehen, welche die Diskussion um die Zuständigkeit von Wirkungsanalysen im Schulsport beflügeln.

#### References:

- Chang, Y. K., Labban, J. D., Gapin, J. I., & Etnier, J. L. (2012). The effects of acute exercise on cognitive performance: A meta-analysis. *Brain Research*, 1453, 87-101.
- Diamond, A. (2000). Close interrelation of motor development and cognitive development and of the cerebellum and prefrontal cortex. *Child Development*, 71, 44-56.
- Etnier, J. L., Nowell, P. M., Landers, D. M., & Sibley, B. A. (2006). A meta-regression to examine the relationship between aerobic fitness and cognitive performance. *BRAIN RESEARCH*, 52, 119-130.
- Hillman, C. H., Erickson, K. I., & Kramer, A. F. (2008). Be smart, exercise your heart: exercise effects on brain and cognition. *Nature Reviews Neuroscience*, 9, 58-65.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Gesundheit und Sportunterricht – (weiterhin) eine unwohlvolle Allianz?

### Authors: Sudeck G<sup>1</sup>.

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### Abstract:

Mit der Grundannahme einer frühzeitigen Bahnung von Gesundheitsverhaltensweisen im Kindes- und Jugendalter bis ins Erwachsenenalter (Tracking) verstärkt sich sowohl in Gesundheitspolitik als auch Gesundheitsforschung ein besonderer Fokus auf in frühen Lebensphasen ansetzende Gesundheitsförderung und Prävention. Das Setting Schule spielt für die Gesundheitsförderung und Prävention im Kindes- und Jugendalter eine ganz wesentliche Rolle. In diesem Setting können aufgrund der Schulpflicht nahezu alle Kinder und Jugendliche unabhängig von sozialen Ungleichheiten (z. B. sozio-ökonomischer Status, Migrationshintergrund) erreicht werden und sozial determinierte gesundheitliche Ungleichheiten prinzipiell minimiert werden. Neben dieser eher von außen, von Gesundheitspolitik und Gesundheitswissenschaft, an die Schulen herangetragenem Ziele der Gesundheitsförderung bei Kindern und Jugendlichen, finden sich ebenso in Begründungsmustern des Sportunterrichts und entsprechenden Lehrplänen gesundheitsbezogene Zielsetzungen. Die Schulsportforschung im deutschsprachigen Raum hat sich insbesondere in normativen Diskursen mit der Zielsetzung Gesundheit beschäftigt, wobei etwa in der Instrumentalisierungsdebatte kontroverse Positionen des Für und Wider einer Gesundheitsthematik für den Sportunterricht deutlich wurden. Eine empirisch ausgerichtete Schulsportforschung ist im deutschsprachigen Raum in dieser Hinsicht bislang noch deutlich weniger ausgeprägt. Wie aber einer aktuellen Übersicht über 129 internationalen Studien zur Gesundheitsförderung und Prävention im Sportunterricht entnommen werden kann (Demetriou & Höner, 2012), sind diverse schulbasierte Interventionskonzepte insbesondere in der gesundheits- und fitnessbezogenen Wissensvermittlung (88% positive Interventionseffekte) und der Förderung der körperlichen Fitness (70% positive Interventionseffekte) erfolgreich. Während die Förderung körperlicher Aktivität noch mehrheitlich gelang, scheinen Einstellungsänderungen (44% positive Interventionseffekte) und eine positive Beeinflussung des Körpergewichts (28% positive Interventionseffekte) schwieriger erreichbar. Solchen Evidenzbasierungen schulbasierter Interventionskonzepte stehen nicht selten Vorbehalte im Hinblick auf eine inadäquate Instrumentalisierung des Sportunterrichts, eine unangemessene Reduktion von Bildungsansprüchen oder einer mangelnden Schülerorientierung gegenüber. Angesichts dieser strittigen Facetten der Gesundheits- und Fitnesssthematik im Sportunterricht versucht der Beitrag aufbauend auf einer Einordnung empirischer Befunde aktuelle Zugänge zur zielgruppengerechten Thematisierung von Gesundheit und Fitness im Sportunterricht zusammenzutragen, um Potenziale und Grenzen für eine Überwindung einer möglicherweise unwohlvollen Allianz zu identifizieren und sie einer empirisch orientierten Schulsportforschung im stärkeren Maße zugänglich zu machen.

### References:

Demetriou, Y., & Höner, O. (2012). Physical activity interventions in the school setting: A systematic review. *Psychology of Sport and Exercise*, 13, 186-196.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Zwischen ‚Bildungspathos und Erziehungswirklichkeit‘ – zur Fundierung und Empirisierung sportpädagogischer Bildungserwartungen

**Authors:** Gogoll, A.

EHS Magglingen, Schweiz

### Abstract:

Mit den internationalen Schulleistungsstudien zum Jahrhundertwechsel wurde offensichtlich, dass in vielen Bildungssystemen der OECD eine Diskrepanz zwischen „Bildungspathos und Erziehungswirklichkeit“ (Lepenes, 2003) besteht: Was vor TIMSS und PISA noch relativ erfüllungssicher als Bildungseffekt unterrichtlicher Bemühungen erwartet werden konnte, entpuppte sich angesichts der erreichten Testergebnisse vieler Schülerinnen und Schüler als normative Träumerei.

Die empirisch registrierte Differenz hat eine bildungswissenschaftliche Diskussion in Gang gebracht hat, die noch immer mit dem nachträglichen Justieren und Absichern enttäuschter Bildungserwartungen beschäftigt ist. Ein interner Prozess der Selbstregulation, der durch eine „Veralltäglichen des Phänomens Bildung“ und die „Empirisierung des Bildungsbegriffs“ charakterisiert werden kann (Tenorth, 2004): Erwartungen im Hinblick auf zu erreichende Schülerleistungen sollen sich demnach nicht länger aus weltumspannenden und hochtrabenden Bildungsansprüchen speisen, die sich durch den Verweis auf ein normatives Bildungsideal gegen kontrafaktische Erfahrungen abschirmen. Sie sind vielmehr an im Schulalltag realisierbaren Bildungszielen zu orientieren, die auf einem theoretisch fixierten, operationalisierbaren und empirisch zu überprüfenden Kompetenzmodell basieren.

Im vorliegenden Beitrag beschäftige ich mich mit der Frage, auf welche Weise(n) die Sportpädagogik ihre Bildungserwartungen an diese Neuausrichtung anpasst. Welcher empirisch messbarer Bildungoutput kann als legitime Zielgrösse sportunterrichtlicher Wirkungsanalysen gelten? Wie lässt sich dieser Output im Anschluss an konsensfähige Bildungsziele des Fachbereichs Bewegung und Sport modellieren? Auf welche Weise kann die Effektivität des Sportunterrichts im Hinblick auf ein Erreichen des Bildungoutputs gemessen werden? Welche Unterstützung erhofft sich die Sportpädagogik dabei von der Sportpsychologie?

### References:

- Lepenes, W. (2003). *Bildungspathos und Erziehungswirklichkeit*. In N. Killius, J. Kluge, & L. Reisch (Ed.), *Die Zukunft der Bildung* (S. 13-31). Frankfurt am Main: Suhrkamp.
- Tenorth, H.-E. (2004). Stichwort: „Grundbildung“ und „Basiskompetenzen“. Herkunft, Bedeutung und Probleme im Kontext allgemeiner Bildung. *Zeitschrift für Erziehungswissenschaft*, 7 (2), 169-182.

## 6<sup>e</sup> Congrès annuel de la 4S 2014 à Fribourg

**Title:** Santé et (in-)activités physiques parmi des enfants de quartiers populaires

**Authors:** Aceti Monica<sup>1</sup>, Masserey Yannick<sup>2</sup>, Vieille Marchiset Gilles<sup>3</sup>

<sup>1</sup> Unité science du mouvement et du sport, Université de Fribourg, Suisse

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### **Abstract:**

#### **Introduction:**

Sur fond de risques sanitaires, l'action publique conforte par les enquêtes épidémiologiques les offres de santé et imprègne l'espace public ou la «cité salubre» (Fassin, 2001) avec des messages de prévention (Peretti-Watel & Moatti, 2009), parfois hautement normatifs: «*Un enfant sur 5 est en surpoids. Agissez à temps... Alors on se bouge?*»<sup>1</sup>. Partant de la corrélation entre santé déficitaire et manque d'activité physique (Cavill, Kahlmeier & Racioppi, 2006), l'objectif d'*augmenter* l'activité physique de la population s'est récemment imposé comme un domaine d'action de l'intervention publique soutenue par des programmes de promotion de la santé (Aceti M., Vieille Marchiset G., 2014) en plus des secteurs en place (OFSP, associations sportives, marché).

Dans le cadre d'un programme de recherche international ([APSAPA.Europe](#)), l'exploration des catégories d'analyse qui révèlent différents rapports à la santé en lien avec les AP (Activités Physiques) est effectuée auprès d'habitants de quartiers *reconnus* comme populaires. L'objectif est d'interroger et de comprendre les raisons de cette plus faible adhésion à des injonctions largement diffusées et reconnues comme désirables dans la population en général.

#### **Methods:**

Cette étude comparative des rapports à la santé s'applique dans un premier temps à des enfants de 8-10 ans, dont on identifie les déterminants socio-économiques, les conditions de vie et les comportements vis-à-vis des pratiques de santé liées aux AP. Deux terrains situés en Suisse romande (quartier de Villars-Vert, canton FR, N= 17 enfants ; quartier de Vissigen-Champsec, canton VS, N= 37) seront présentés au regard des données exploratoires des autres terrains, situés en Italie (N= 38), en Allemagne (N= 15) et en France (N= 55). À partir du croisement entre les données provenant des focus groupes avec les enfants et les observations ethnographiques des environnements urbanistiques et sociaux, des modes de vie plus ou moins «actifs» ont pu être répertoriés.

#### **Results:**

Les facilitations et les barrières au devenir «entrepreneur de sa santé» parmi les populations de nos échantillons ont fait apparaître des éthiques morales en fonction des cultures institutionnelles, mais également des divergences dans les «hexis corporelles», structurées par les contextes familiaux et socioculturels.

#### **Discussion/Conclusion:**

Il s'agira ensuite d'interroger les possibilités d'appropriations de cette «santéisation» parmi les habitants d'environnements écosanitaires insalubres et parfois même toxiques comme pour le cas du terrain de Naples.

#### **References:**

- Aceti M., Vieille Marchiset G. (2014). Un capital salubre à transmettre: analyse comparative des programmes de promotion de la santé par l'activité physique en Europe, Revue *JuriSport*, Juris éditions, Dalloz. (*en cours d'édition*)
- Cavill, N., Kahlmeier, S. & Racioppi, F. (2006). Physical activities and health in Europe, evidence for action, [http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0011/87545/E89490.pdf](http://www.euro.who.int/__data/assets/pdf_file/0011/87545/E89490.pdf).
- Fassin, D. (2001). Au cœur de la cité salubre. In J.-P. Dozon & D. Fassin (Eds). *Critique de la santé publique. Une approche anthropologique*, Paris: Balland, pp. 47-73.
- Peretti-Watel, P. & Moatti, J.P. (2009). *Le principe de prévention. Le culte de la santé et ses dérives*, Paris: éd. du Seuil.

<sup>1</sup> Spot Gesundheitförderung Schweiz « Schaukel », 9.03.2010.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Personenwahrnehmung während Badminton Herrendoppelspielen – Eine qualitative Analyse mittels Selbstkonfrontationsinterviews

**Authors:** Graf, D.<sup>1</sup>, Adamer, A.<sup>1</sup>. & Seiler, R.<sup>1</sup>

<sup>1</sup>Institut für Sportwissenschaft, Universität Bern, Schweiz

### Abstract:

#### Introduction:

Die Forschung zur Personenwahrnehmung im Sport beschränkt sich mehrheitlich auf die Bildung des ersten Eindrucks. So befragten beispielsweise Rimmer, Greenlees, Graydon, Thelwell und Buscombe (2008) in einer qualitativen Studie Tennisspieler dazu, welche Eindrücke sie sich von ihrem Gegner vor einem Spiel bilden und welche Auswirkungen diese ersten Eindrücke auf den Spielverlauf hätten. Dabei wird vermutet, dass diese ersten Eindrücke mindestens zu Beginn einer Interaktion oder eben eines Tennisspiels handlungswirksam sind. Da aber im Verlaufe der Interaktion neue und vermutlich relevantere Informationen verfügbar werden, ist es naheliegend, dass der erste Eindruck revidiert oder von anderen Urteilen abgelöst wird (Greenlees, Bradley, Holder & Thelwell, 2005).

Hier setzt die vorliegende Studie an, in dem sie einen Schritt weitergeht und untersucht, welche Eindrücke sich Badminton Doppelspieler im Verlaufe eines ganzen Spieles von ihrem Partner und den Gegnern bilden und welche Erwartungs- und affektiven Reaktionen diese Eindrücke auslösen. Dabei dient das Modell der Personenwahrnehmung von Warr und Knapper (1968) als theoretische Grundlage.

#### Methods:

Mit 13 männlichen Badmintonspielern (11 NLA- und 2 Erstliga-Spieler;  $M=26.15$  Jahre,  $SD=5.27$ ) wurden Selbstkonfrontationsinterviews durchgeführt. Dazu wurden die Spieler während eines Herrendoppels, das im Rahmen eines Interclub-Gruppenspiels ausgetragen wurde, gefilmt. Im direkten Anschluss oder aber spätestens 48 Stunden nach diesem Spiel wurden die Spieler mit der Videoaufnahme ihres Spieles konfrontiert und dazu aufgefordert, während der Betrachtung des Spieles ihre Gedanken zu schildern, die sie in den konkreten Situationen über die dabei beteiligten Spieler hatten. Anschliessend erfolgte die Transkription und Auswertung der Interviews mittels einer qualitativen Inhaltsanalyse nach Mayring (2008; Technik der inhaltlichen Strukturierung). Diesen letzten Schritt führten die beiden erstgenannten Autoren durch, was die Berechnung einer Interrater-Reliabilität erlaubt.

#### Results:

Die Datenerhebung ist abgeschlossen, die inhaltliche Strukturierung noch im Gang. Vorläufige Resultate aufgrund bereits vollzogener Analyseschritte zeigen, dass die von den Probanden geäusserten Eindrücke sich aus Einschätzungen zur aktuellen und dispositionalen Leistungsfähigkeit, zum mentalen Zustand, zu den Charaktereigenschaften und zu den Absichten der anderen Spieler zusammensetzen. Die Erwartungsreaktionen beziehen sich hauptsächlich auf den erwarteten Ausgang des Spiels und die antizipierte Spielweise der beteiligten Spieler. Die affektiven Reaktionen bestehen mehrheitlich aus emotionalen Reaktionen auf Fehler resp. Gewinnschläge des Partners und aus aufgrund des Spielverlaufs entstandenen Gefühlen wie Selbstvertrauen oder Unsicherheit.

#### References:

- Greenlees, I., Bradley, A., Holder, T. & Thelwell, R. (2005). The impact of opponents' non-verbal behaviour on the first impressions and outcome expectations of table-tennis players. *Psychology of Sport & Exercise*, 6, 103-115.
- Rimmer, M., Greenlees, I., Graydon, J., Thelwell, R. & Buscombe, R. (2008). A qualitative examination of tennis players' experiences of the person perception process in tennis. *International Journal of Sport Psychology*, 39, 279-300.
- Warr, P.B. & Knapper, C. (1968). *The perception of people and events*. London: John Wiley & Sons.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

**Title:** Qualitätsmerkmale des Sportunterrichts und ihre Vorhersagekraft für Lernleistungen von Schülern und Schülerinnen. Ergebnisse der IMPEQT-Studie.

**Authors:** Leyener S<sub>1</sub>, Herrmann C<sub>1</sub>, Pühse U<sub>1</sub>, Gerlach E<sub>1,2</sub>

<sup>1</sup>Institut für Sport und Sportwissenschaft, Universität Basel, Schweiz

<sup>2</sup>Profilbereich Bildungswissenschaften, Universität Potsdam, Deutschland

### **Abstract:**

#### **Introduction:**

Eine der zentralen Aussagen des derzeit wohl prominentesten Bildungsforschers John Hattie (2013) ist, dass die Qualität des Unterrichts – so wie sie aus Schülersicht wahrgenommen wird – einen entscheidenden Faktor für Lernleistungen von Schülern und Schülerinnen darstellt. In der empirischen Bildungsforschung findet sich eine Reihe von Studien, die der Frage des Einflusses von Prozessmerkmalen auf Lernleistungen nachgehen (im Überblick Helmke, 2010). Allerdings ist die Befundlage für das Fach Sport im Vergleich zu den Hauptfächern unbefriedigend. Noch ungeklärt ist zudem, was als Lernleistung eines Schülers im Fach Sport zu begreifen ist. Fähigkeitsorientierte Tests reichen hier nicht aus, da sie die zu erwerbenden Kompetenzen unangemessen reduzieren. Aktuell ist der MOBAQ-Ansatz zur Erfassung motorischer Basisqualifikationen aus unserer Sicht der Ansatz, der sportunterrichtliche Lernleistungen am ehesten erfassen kann (Kurz, Fritz & Tscherpel, 2008). Die zentrale Annahme dabei ist, dass komplexe und kontextbezogene Basisqualifikationen die wesentliche Voraussetzung für einen Zugang zur Bewegungs-, Spiel- und Sportkultur darstellen. Dieser Beitrag geht der Fragestellung nach, inwieweit Merkmale guten Unterrichts die MOBAQs beeinflussen.

#### **Methods:**

In der, durch die Eidgenössische Sportkommission finanzierten, IMPEQT-Studie (Implementation of Physical Education and the Quality of Teaching) der Universität Basel (Projektleitung: Prof. Dr. Erin Gerlach), wurden im Rahmen eines einjährigen Längsschnitts zwölf motorische Basisqualifikationen sowie Unterrichtsmerkmale mittels Fragebogen in 45 Klassen an Schweizer Schulen (N = 1092) erhoben.

#### **Results:**

Erste querschnittliche Ergebnisse zeigten, dass vor allem auf Individualebene die Merkmale „Angst vor der Lehrkraft“ und „Motivation durch die Sportlehrkraft“ eine wichtige Rolle spielen. Auf Klassenebene hingegen die Merkmale „Klassenführung“ sowie „Disziplin & Zeitnutzung“ wichtig sind. Im Längsschnitt zeigt vor allem das Merkmal „Motivation durch die Lehrperson“ in den „MOBAQ-Körper-Aufgaben“ signifikanten Einfluss. Betrachtet man zusätzlich den Geschlechtereffekt, können auch Einflussnahmen der individuellen Bezugsnormorientierung auf Lernergebnisse der Mädchen oder Jungen festgestellt werden.

#### **Discussion/Conclusion:**

Die Ergebnisse generieren empirisches Hintergrundwissen, welches vor allem für die Lehrerbildung von hoher Relevanz ist. In der Diskussion kann ein Ausblick auf weitere Einflussparameter und Zusammenhänge zwischen den Merkmalen angesprochen werden.

#### **References:**

- Hattie, J. (2013). *Lernen sichtbar machen. Überarbeitete deutschsprachige Ausgabe von Visible Learning von W. Beywl und K. Zierer*. Baltmannsweiler: Schneider
- Helmke, A. (2010). *Unterrichtsqualität und Lehrerprofessionalität: Diagnose, Evaluation und Verbesserung des Unterrichts* (3. Aufl.). Seelze-Velber: Kallmeyer.
- Kurz, D., Fritz, T. & Tscherpel, R. (2008). Der MOBAQ-Ansatz als Konzept für Mindeststandards für den Sportunterricht? In V. Oesterhelt, J. Hofmann, M. Scholz & H. Altenberger (Hrsg.), *Sportpädagogik im Spannungsfeld gesellschaftlicher Erwartungen, wissenschaftlicher Ansprüche und empirischer Befunde* (S. 97-106). Hamburg: Czwalina.

## Abstractvorlage 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg

### Title:

Strukturelle und kulturelle Faktoren der Sportpartizipation Jugendlicher und junger Erwachsener.

**Authors:** Klostermann C.<sup>1</sup>, Hayoz C.<sup>1</sup>, Schlesinger T.<sup>1</sup>, Nagel S.<sup>1</sup>

<sup>1</sup>Institut für Sportwissenschaft, Universität Bern, Schweiz

### Abstract:

#### Einführung:

Trotz vielfältiger Bemühungen der Sport- und Bewegungsförderung bestehen nach wie vor soziale Ungleichheiten hinsichtlich der Sportbeteiligung von Jugendlichen und jungen Erwachsenen. Weiterhin stellt sich die Frage nach den Ursachen für die relativ deutlichen Unterschiede der Sportpartizipationsquote in den Sprachräumen der Schweiz (z.B. Lamprecht, Fischer & Stamm, 2008). Zur Analyse dieses Phänomens erscheint die isolierte Betrachtung individueller Merkmale nicht ausreichend zu sein, sondern es sind auch kulturell geprägte Wertvorstellungen (z.B. Sportverständnis) und sportbezogene Strukturbedingungen im kommunalen Kontext (z.B. Sportangebote) in den Fokus zu rücken.

#### Theoretischer Ansatz:

Auf Basis des akteurtheoretischen Zugangs (Schimank, 2010) werden sportbezogene Kontextbedingungen als Gelegenheitsstrukturen betrachtet, die Anreize schaffen und zu Parametern individuellen sportiven Handelns werden können. Die sportbezogenen Strukturbedingungen werden als Erwartungsstrukturen und die kulturell geprägten Faktoren auf der Basis des Habituskonzepts von Bourdieu (1979) als Deutungsstrukturen in einem Mehrebenenmodell konzeptualisiert.

#### Methodisches Vorgehen:

Die hierzu erforderlichen individuellen Sportverhaltensdaten und kulturell geprägten Wertvorstellungen sowie strukturellen Bedingungen wurden im kommunalen Kontext im Rahmen eines Vergleichs der deutschsprachigen Gemeinde Hünenberg (Zug) mit der französischsprachigen Gemeinde Marly (Fribourg) untersucht (Fallstudien-Design). Die Individualdaten wurden anhand einer Online-Befragung Jugendlicher und junger Erwachsener im Alter von 15 bis 25 Jahren (Hünenberg:  $N = 106$ ; Marly:  $N = 99$ ) und die sportbezogene Strukturdaten durch die Befragung von Personen aus der Gemeindeverwaltung und von Sportanbietern sowie Dokumentenanalysen differenziert erhoben.

#### Ergebnisse und Diskussion:

Insgesamt ist die Sportbeteiligung der befragten 15- bis 25-Jährigen mit ca. 88 Prozent als relativ hoch einzustufen, wobei die Sportbeteiligung der Befragten in Marly deutlich geringer ist ( $\chi^2(1, N = 205) = 3.84, p < .05$ ). Erste Analysen zeigen, dass sich die Befragten aus beiden Gemeinden hinsichtlich ihrer Einschätzungen der sportbezogenen Strukturbedingungen unterscheiden. So bewerten beispielsweise die Befragten aus Hünenberg die bewegungsfreundliche Gestaltung des öffentlichen Raums ( $M = 3.88, SD = .73$ ) sowie die Bewegungsinfrastruktur besser ( $M = 4.14, SD = .88$ ) als die Befragten aus Marly ( $M = 3.29, SD = 1.07$  und  $M = 3.17, SD = 1.23$ ). Ebenso zeigen sich Unterschiede beim Sportverständnis sowie kulturell geprägten sport-, gesundheits- und körperbezogenen Einstellungen. So verbinden beispielsweise mehr Befragte aus Marly (ca. 88.9 %) Sport mit dem Begriff „Gesundheit“, während die Befragten aus Hünenberg eher die Begriffe „Bewegung“ (ca. 91.5 %) und „Training“ (ca. 86.8 %) dem Sport zuordnen.

Die dargestellten Befunde bestätigen eine relativ geringe Sportbeteiligung in der Romandie und sie weisen darüber hinaus darauf hin, dass sowohl sportbezogene Strukturbedingungen als auch kulturell geprägte sport- und bewegungsbezogene Einstellungen zur Erklärung dieses Phänomens heranzuziehen sind. Jedoch ist zu beachten, dass es sich hierbei um eine erste explorative Fallstudie handelt und zur Verallgemeinerung der Ergebnisse noch Analysen in weiteren Gemeinden unabdingbar sind.

### References:

Bourdieu, P. (1979). *Die feinen Unterschiede. Kritik der gesellschaftlichen Urteilskraft*. Frankfurt/M.: Suhrkamp.

Lamprecht, M., Fischer, A. & Stamm, H. (2008). *Sport Schweiz 2008. Kinder- und Jugendbericht*. Magglingen:

BASPO.

Schimank, U. (2010). *Handeln und Strukturen. Einführung in die akteurtheoretische Soziologie*. Weinheim: Juventa.



## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Entscheidungsprozesse in Sportvereinen in Zusammenhang mit externer Beratung

**Authors:** Egli Benjamin<sup>1</sup>, Splinter Mariëlle<sup>1</sup>, Schlesinger Torsten<sup>1</sup>, Nagel Siegfried<sup>1</sup>.

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### Abstract:

#### Introduction:

Verbunden mit den steigenden Mitgliederzahlen, fällt es Sportvereinen zunehmend schwer, die vielfältige Nachfrage zu bedienen und die hohen Erwartungen zu erfüllen. Viele Schweizer Sportvereine bekunden Probleme, insbesondere im Bereich der Gewinnung und Bindung von ehrenamtlichen Mitarbeitern (Lamprecht, Fischer & Stamm, 2012). Da ca. 90 % der Schweizer Sportvereine ehrenamtlich organisiert sind und die Erfüllung des Vereinszwecks direkt mit dem ehrenamtlichen Engagement der Vereinsmitglieder zusammenspielt, führt der Mangel an Ehrenamtlichen zu erheblichen Problemen. Sportvereine können diese skizzierten Herausforderungen aufgrund deren Komplexität und den eigenen begrenzten Ressourcen nicht mehr alleine bewältigen und sind deshalb auf Wissen von aussen angewiesen (Bette, 2009). Damit stellt sich zugleich die Frage, inwieweit von aussen an Sportvereine herangetragene Steuerungspraktiken und Beratungsprogramme (z.B. durch Sportverbände) in Bezug auf den Umgang mit personalen Problemlagen wirksam sind oder nicht. So lässt sich vielfach beobachten, dass standardisierte Beratungsinputs im Verein zu unterschiedlichen Konsequenzen führen. Demnach ist zu vermuten, dass externe Impulse vereinsintern in unterschiedlicher Art und Weise interpretiert und in Vereinsrealität übersetzt (programmiert) werden. Solche Prozesse sind in hohem Masse an die vereinspezifischen Reproduktionsbedingungen, also Entscheidungsprozesse gebunden. Deshalb stellt sich die Frage: Welche organisationalen Entscheidungsprozesse im Allgemeinen und speziell in Zusammenhang mit externer Beratung sind in Sportvereinen zu beobachten?

#### Methods:

Die Daten zur Analyse der Entscheidungsprozesse wurden im Rahmen des Projekts „Mehr Freiwillige im Fussballverein“ (MFIF) in Kooperation mit dem Schweizerischen Fussballverband (SFV) in elf Fussballvereinen erhoben. Die Interventionsstudie umfasst vier Aspekte: (1) systematischer Ansatz, (2) Einbezug aller Vereinsmitglieder, (3) konsequente Implementation in den Fussballvereinen und (4) eine längerfristige Bindungsstrategie für ehrenamtliche Mitarbeiter. Die Daten wurden einerseits über Fragebogen zur Struktur des Vereins und den Ergebnissen des Projekts erhoben, andererseits wurden leitfadengestützte Interviews mit den führenden Vereinsvertretern in den Projektgruppen durchgeführt und anschliessend anhand qualitativer Inhaltsanalyse ausgewertet (Mayring, 2010).

#### Results:

Die Auswertung der Interviews zeigt auf, dass verschiedene Faktoren für eine erfolgreiche Umsetzung einer Gewinnungs- und Bindungsstrategie entscheidend sind. Einerseits wird die Rolle der zuständigen Personen unterschiedlich interpretiert und deshalb fällt das Engagement im Entscheidungsprozess unterschiedlich aus. Die Bandbreite reicht vom Informator über den Moderator bis hin zum aktiven Promotor. Mit Blick auf die externe Beratung lässt sich erkennen, dass die Fussballvereine die Unterstützung unterschiedlich einordnen. Dem traditionellen Beratungskonzept folgend anerkennen Vereine die externe Beratung als bewährte Musterlösung und verfolgen unreflektiert die vorgeschlagene Lösungsstrategie. Gleichzeitig lässt sich eine zweite Gruppe von Vereinen entsprechend dem systemischen Beratungskonzept durch die externe Beratung irritieren und hinterfragt die eigene Struktur und sucht nach eine passenden Lösungsstrategie.

#### Discussion/Conclusion:

Die Untersuchung zeigt auf, dass externe Vereinsberatung sowohl mimetisch, wie auch als systemische Beratung interpretiert zu Verbesserungen im Bereich des Ehrenamtmanagements in Sportvereinen führen kann.

(ABSTRACT TRUNCATED)

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Synergies football masculin et féminin : vers un nouveau modèle stratégique pour les clubs professionnels européens ?

**Authors:** Emmanuel Bayle, Emilie Jaccard et Philippe Vonnard.

Institut des sciences du sport (ISSUL), Université de Lausanne, Suisse

### Abstract:

#### Introduction:

Le football féminin est en pleine expansion et reconnaissance. Il est perçu comme un levier important pour les fédérations nationales et pour l'UEFA en terme de nouveaux publics, de marketing et de valeurs (synonyme d'un football plus « responsable »). Au sein des grands clubs européens se côtoient le plus souvent des équipes féminines et masculines, entraînant des synergies dans des domaines variés, que nous avons tenté de les analyser dans le cadre de cette recherche.

#### Methods:

Ces synergies au sein des clubs mixtes européens ont été analysées à partir d'un cadre d'analyse construit de manière ad hoc. Celui-ci s'appuie sur une approche par les stratégies d'acteurs en fonction du contexte national et local, ainsi que sur six domaines de fonctionnement interne des deux sections. La collecte de données a été réalisée auprès de 14 grands clubs mixtes européens répartis dans 9 pays européens aux cultures très différentes (France : Olympique Lyonnais et Paris-St.-Germain FC ; Angleterre : Birmingham City LFC et Arsenal Ladies FC ; République Tchèque : SK Slavia Praha et AC Sparta Praha ; Allemagne : SC Freiburg et VfL Wolfsburg ; Belgique : Standard Fémina de Liège ; Pays-Bas : Ado den Haag ; Danemark : Brøndby IF ; Norvège : Stabæk FK ; Suisse : FC Zürich et BSC Young Boys), grâce à des entretiens et à l'étude de différents documents fournis par le département dédié au football féminin à l'UEFA. Les résultats seront discutés aux regards des théories des ressources et des compétences stratégiques, et de la responsabilité sociale des organisations.

#### Results:

Cette analyse des données permet d'observer trois types de modèles : totalement intégré (Stabæk FK), globalement intégré (Arsenal, OL, PSG, Wolfsburg, ...) et partiellement intégré (FC Zürich, Brøndby IF, Ado den Haag). Dans le premier cas, on observe une volonté commune illustrée par un slogan fort « One club, one strategy, one administration » d'apparaître comme un club uni, dans un pays à la culture footballistique forte au sein de la gente féminine. Le deuxième cas est la situation la plus fréquente dans les clubs étudiés. La stratégie est souvent commune, mais le management reste séparé que ce soit au niveau sportif ou administratif. On observe de fortes collaborations au niveau commercial, marketing et communication, et également des dotations financière directe ou indirecte de la part de la section masculine. Dans le troisième et dernier cas, les stratégies sont généralement intégrées mais le management est séparé et les synergies sont éparpillées et floues. Parfois les deux sections jouent dans un même stade, ont un site internet commun, mais la gestion de la section féminine reste séparée, la section masculine garantissant souvent uniquement une sécurité financière.

#### Discussion/Conclusion:

Les configurations mises en évidence sont les produits d'une histoire récente et souvent encore en construction. L'OL apparaît comme un exemple de collaboration plutôt réussi et efficace. Cette réussite permet d'afficher la section féminine comme un axe stratégique important. Ces synergies permettent un effet d'apprentissage et d'expertise accéléré en termes de notoriété, de savoir-faire et de professionnalisation. Les éléments identifiés dans les clubs peuvent constituer des ressources et des compétences nouvelles pour la réussite des clubs mixtes, que ce soit au niveau de la stratégie, de l'utilisation des équipements et infrastructures, des aspects commerciaux, de la communication et marketing et des ressources humaines.

(ABSTRACT TRUNCATED)

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

La démarche réflexive en éducation physique : Une étude de cas contrastée dans l'enseignement primaire et secondaire à Genève

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### Abstract:

Mots clefs : éducation physique, *démarche* réflexive, enseignement primaire et secondaire

L'éducation physique (EP) à Genève est organisée à partir de deux documents principaux. D'une part, les Manuels fédéraux d'EP qui régissent l'enseignement de cette discipline dans toute la Suisse et, d'autre part, le nouveau plan d'études romand (PER), qui prescrit les intentions et attentes spécifiques pour cette région du pays. Les deux documents, dans des formulations qui leur sont propres, mettent l'accent sur le développement de la démarche réflexive des élèves. Des propositions faites par les concepteurs de ces documents, il se dégage une manière de penser l'enseignement et l'apprentissage qui voudrait se démarquer des conceptions traditionnelles que l'on observe habituellement dans les classes. Ces propositions induisent des changements au niveau des places occupées et des modes d'action des acteurs (enseignant-élèves), introduisant par ce fait des formes d'interaction qui tendent à modifier, en même temps, le processus d'attentes réciproques (Amade-Escot, 2007). Dans le cadre de notre intervention, nous rendons compte des situations d'apprentissage en EP lors des leçons portant sur des jeux sportifs collectifs. Plus précisément, nous nous intéressons aux moments de mise en place des conditions d'étude et aux transactions didactiques lors de moments de régulation des tâches. Ceci afin de dégager (i) les objets de savoir mis à l'étude, (ii) l'action de l'enseignant favorisant l'intériorisation des contenus à travers une démarche réflexive. Notre intervention concerne l'étude comparative de deux leçons d'éducation physique de deux recherches en cours, l'une portant sur l'enseignement du basketball à l'école primaire, l'autre réalisée dans le cadre de l'école secondaire obligatoire (12-15 ans) dont l'objet d'enseignement est le volleyball. Notre cadre conceptuel s'organise principalement à partir des théories de l'agir ensemble et des travaux développés par les chercheurs en didactique comparée (Sensevy & Mercier, 2007). Les données ont été recueillies à travers deux types de méthodes : des entretiens avec les enseignants (*ante* et *post* séance) et la vidéoscopie des leçons observées. C'est à travers des synopsis et différentes échelles d'analyse que nous avons effectué la réduction et le traitement de ces données. Les premiers résultats montrent des formes d'action didactiques génériques chez les deux enseignants, notamment une volonté commune de « faire de la place aux élèves » (Loquet, 2007). Les régulations sont systématiquement initiées par une ou des questions adressées aux élèves et selon les moments de la séance, la posture de l'enseignant varie d'un topos en retrait (observation du jeu) aux interventions en surplomb. Pour l'enseignant à l'école primaire, les temps de verbalisation doivent permettre aux élèves d'identifier les traits pertinents et construire les règles d'action. Si le temps didactique avance, les milieux d'étude sont éloignés de la pratique du basketball. A l'école secondaire, les phases du jeu didactique se caractérisent par l'absence d'une réelle problématisation, l'enseignant n'exploitant que partiellement un milieu potentiellement riche et prometteur. Dans les deux cas, la référence construite semble ainsi avoir une valeur de portée essentiellement « locale » (Schubauer-Leoni, 2008).

### References:

Amade-Escot, C., Garnier, A. & Monnier, N. (2007). La dynamique contractuelle du processus didactique. In A. Amade-Escot (dir.), *Le didactique*, (pp. 31-48). Paris : Editions EP.S. (ABSTRACT TRUNCATED)

**Title:**

Individual group efficacy beliefs and performance motivation: A mediational approach

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**Abstract:**

**Introduction:**

According to the theoretical model of Cranach, Ochsenein, and Valach (1986) understanding group actions needs consideration of aspects at both the group level and the level of individual members. For example individual action units constituting group actions are motivated at the individual level while potentially being affected by characteristics of the group. Theoretically, group efficacy beliefs could be a part of this motivational process as they are an individual's cognitive contents about group-level abilities to perform well in a specific task. Positive relations between group level efficacy-beliefs and group performance have been reported and Bandura and Locke (2003) argue that this relationship is being mediated by motivational processes and goal setting.

The aims of this study were a) to examine the effects of group characteristics on individual performance motivation and b) to test if those are mediated by individual group efficacy beliefs.

**Methods:**

Forty-seven students ( $M=22.83$  years,  $SD=2.83$ , 34% women) of the university of Berne participated in this scenario based experiment. Data were collected on two collection points. Subjects were provided information about fictive team members with whom they had to perform a group triathlon. Three values (low, medium, high) of the other team members' abilities to perform in their parts of the triathlon (swimming and biking respectively) were combined in a 3x3 full factorial design (Anderson, 1982) yielding nine groups. Subjects were asked how confident they were that the teams would perform well in the task (individual group efficacy beliefs), and to provide information about their motivation to perform at their best in the respective group contexts (performance motivation). Multilevel modeling (Mplus) was used to estimate the effects of the factors *swim* and *bike*, and the context-varying covariate *individual group efficacy beliefs* on performance motivation. Further analyses were undertaken to test if the effects of group contexts on performance motivation are mediated by individual group efficacy beliefs.

**Results:**

Significant effects were reported for both the group characteristics ( $\beta_{swim} = 7.86$ ;  $\beta_{bike} = 8.57$ ; both  $p < .001$ ) and the individual group efficacy beliefs ( $\beta_{igeb} = .40$ ,  $p < .001$ ) on performance motivation. The subsequent mediation model indicated that the effects of group characteristics on performance motivation were partly mediated by the individual group efficacy beliefs of the subjects with significant mediation effects for both factors *swim* and *bike*.

**Discussion/Conclusion:**

The results of the study provide further support for the motivational character of efficacy beliefs and point out a mechanism by which team characteristics influence performance relevant factors at the level of individual team members. The study indicates that high team abilities lead to augmented performance motivation, adding a psychological advantage to teams already high on task relevant abilities. Future investigations will be aiming at possibilities to keep individual performance motivation high in groups with low task relevant abilities. One possibility could be the formulation of individual task goals.

**References:**

- Anderson, N. H. (1982). *Methods of information integration theory*. New York: Academic Press.
- Bandura, A. & Locke, E. A. (2003). Negative self-efficacy and goal effects revisited. *Journal of Applied Psychology*, 88, 87-99.
- Cranach, M. von, Ochsenein, G. & Valach, L. (1986). The group as a self-active system: Outline of a theory of group action. *European Journal of Social Psychology*, 16, 193-229.

**SGS Nachwuchs**

**Nachwuchspreis**

**Effects of 2-wk endurance training in severe obese men: high intensity interval *versus* Fat<sub>max</sub> training**

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## Introduction

Endurance exercise training at intensity ( $Fat_{max}$ ) eliciting maximal fat oxidation (MFO) may enhance fat oxidation, muscle oxidative capacity (1) and insulin sensitivity (2) in obese individuals, suggesting its pivotal role in weight management in this population. It has been suggested that 6-wk of high intensity reduced-volume interval training (HIT, Wingate based HIT) induces similar adaptations as traditional training at moderate intensity (similar to  $Fat_{max}$ ) in healthy adults, suggesting that HIT may be a time-efficient alternative (3). Moreover, only 2-wk of adapted HIT (aerobic HIT) may increase the muscle oxidative capacity and glucose control in obese adults (4). However, it has been recently found that 2-wk of reduced-volume HIT (10-s all out sprints) or training at moderate exercise intensity [65% of the peak oxygen uptake ( $V'O_{2peak}$ )] did not elicit any metabolic adaptation in sedentary obese men [body mass index (BMI) ~33], suggesting that 10-s HIT is below the training stimulus threshold required to obtain significant physiological training adaptations (5). Little is known on the metabolic adaptations and fat oxidation rates (FORs) during exercise in severe obese (SO) men ( $BMI \geq 40$ ) after two different training modalities ( $Fat_{max}$  versus adapted HIT). This study aimed to compare the effects of 2-wk of these two different training modalities on the fat oxidation kinetics, insulin sensitivity, non-esterified fatty acids (NEFA) and aerobic fitness in SO men.

## Methods

Eighteen SO men without secondary pathologies were divided into two training groups: a  $Fat_{max}$  training group ( $G_{Fatmax}$ ;  $n=10$ ) or a HIT group ( $G_{HIT}$ ;  $n=8$ ). The two training groups were matched for age, BMI and  $V'O_{2max}$  values (Table 1).

The subjects firstly performed a maximal incremental cycling-ramp test until exhaustion to obtain peak power output (PPO). Then, in the morning after a 12-h overnight fast, subjects performed a maximal incremental test (Incr) preceded by a 15-min seated resting (Rest) to determine the whole-body fat oxidation kinetics and aerobic fitness. After a standardized 10-min warm-up at 20% PPO, the PO was increased by 10% PPO every 5 min until 60% PPO. At this point, the PO was increased by 15W every minute until voluntary exhaustion to determine  $V'O_{2max}$  and maximal heart rate ( $HR_{max}$ ). During the first part of Incr, FORs were calculated using stoichiometric equations (6) and modelled as a function of exercise intensity with SIN model (7) to determine whole-body fat oxidation kinetics,  $Fat_{max}$  and MFO. During Incr, the blood samples were drawn at Rest and at 60% PPO to assess NEFA concentrations. Insulin and glucose concentrations were determined at Rest to measure homeostasis assessment of insulin resistance (HOMA-IR) (8).

Training intervention consisted of 8 cycling-sessions spread over 14 days. For  $G_{Fatmax}$  each session consisted in a 40-50 min continuous exercise bout with an exercise intensity corresponding to the individual  $Fat_{max}$  (~60-70%  $HR_{max}$ ). For  $G_{HIT}$  each session consisted of 10x60-s cycling intervals at ~90%  $HR_{max}$  interspersed with 60-s recovery at 50W. Both training were matched for mechanical work with lower training duration for  $G_{HIT}$  than for  $G_{Fatmax}$ . At least 2 days after the final training session, subjects performed Incr, which was set at the same absolute workload as the pre-training test.

A 3-way repeated-measures ANOVA (time x group x exercise intensity) followed by contrasts was performed to compare FORs and NEFA concentrations in pre-and post-training condition. A 2-way repeated-measures ANOVA (time x group) followed by contrasts was performed to compare the other experimental variables. Cohen's  $d$  values were used as an effect size (ES) index.



## Results

Body weight and BMI decreased significantly in both groups, whereas  $\dot{V}O_{2max}$  increased significantly in both groups (Table 1). MFO and FORs during exercise increased significantly in both groups (Table 1, Figure 1A). Fat oxidation kinetics were characterized by significant right-shift symmetry (i.e., shifting to higher exercise intensity) in both groups (Table 1, Figure 1B). NEFA concentrations showed a significant time x group interaction effect with a significant reduction at Rest in post-training only for  $G_{Fatmax}$  (Figure 2A). Insulin concentrations decreased significantly in both groups, whereas glucose concentrations showed no significant differences (Table 1). HOMA-IR decreased significantly in both groups (Table 1).

The ES for  $\dot{V}O_{2max}$  and MFO was large in  $G_{HIT}$  ( $d=0.76$  and  $d=1.04$ , respectively), whereas was medium for  $\dot{V}O_{2max}$  ( $d=0.48$ ) and small for MFO ( $d=0.35$ ) in  $G_{Fatmax}$ . The ES for HOMA-IR was medium in  $G_{Fatmax}$  ( $d=0.74$ ) and small in  $G_{HIT}$  ( $d=0.15$ ).

## Discussion/Conclusion

This study showed that 1) both training modalities are effective to improve fat oxidation, aerobic fitness and insulin sensitivity in SO men 2) HIT is feasible and safe and may be a time-efficient training for induce metabolic adaptations in SO men.

These results are in contrast with those reporting any metabolic adaptations after both training in obese individuals (5). This may probably be linked in difference in training protocol or in adiposity's degree.

In fact, HIT used by Skleryk et al. (5) consisted in short 10-s all out sprints, and the lack of metabolic responses observed after training compared to our 1-min adapted HIT may suggest that a minimum training threshold in effort duration must be attained to obtain physiological changes. Moreover,  $\dot{V}O_{2max}$  and MFO were more increased after HIT than after  $Fat_{max}$  training (attested by ES), highlighting the primacy of exercise intensity in improving aerobic fitness and MFO.

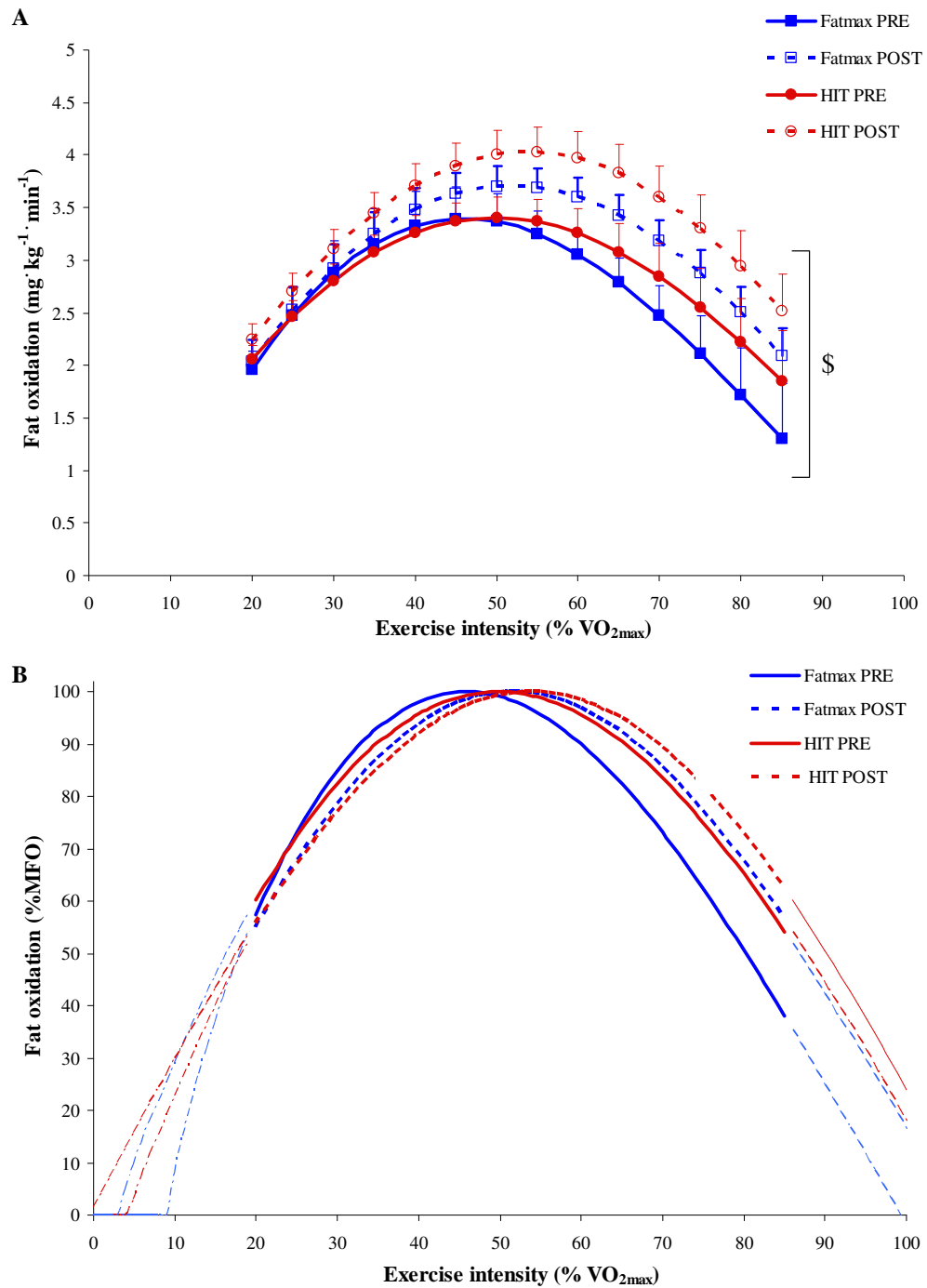
On the other hand,  $Fat_{max}$  training also induces metabolic adaptations suggesting that individualize the training intensity at  $Fat_{max}$  may have important implications in the training programs in SO men. In fact, NEFA concentrations and insulin sensitivity improve to a greater extent in  $G_{Fatmax}$  compared to  $G_{HIT}$ . This confirms previous findings reporting that, after training, plasma NEFA may be used to restore the intra-muscular triglycerides (IMTG) that may be principally oxidized during moderate exercise intensities in obese individuals (9). This IMTG turnover may be involved in reduced lipotoxic intermediates accumulation and thus contribute to increased insulin sensitivity (10).

In conclusion, these two training modalities may be two important complementary training tools and could make an important contribution to weight management in SO men.

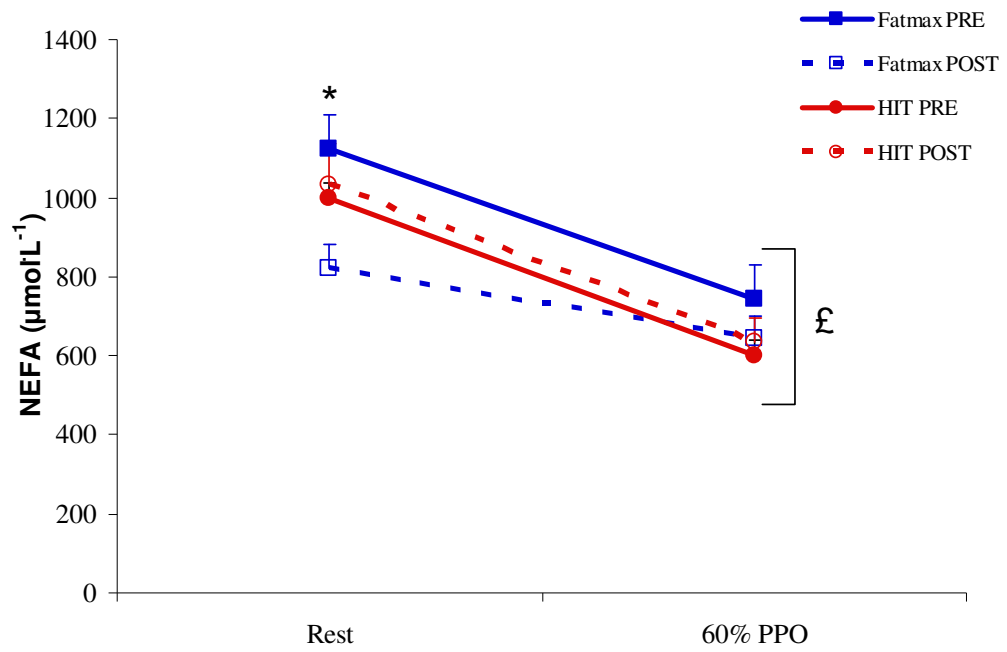
## References

1. Bordenave S, Metz L, Flavier S, Lambert K, Ghanassia E, et al. (2008) Training-induced improvement in lipid oxidation in type 2 diabetes mellitus is related to alterations in muscle mitochondrial activity. Effect of endurance training in type 2 diabetes. *Diabetes Metab* 34: 162-168.
2. Venables MC and Jeukendrup AE (2008) Endurance training and obesity: effect on substrate metabolism and insulin sensitivity. *Med Sci Sports Exerc* 40: 495-502.
3. Burgomaster KA, Howarth KR, Phillips SM, Rakobowchuk M, Macdonald MJ, et al. (2008) Similar metabolic adaptations during exercise after low volume sprint interval and traditional endurance training in humans. *J Physiol* 586: 151-160.
4. Hood MS, Little JP, Tarnopolsky MA, Myslik F and Gibala MJ (2011) Low-volume interval training improves muscle oxidative capacity in sedentary adults. *Med Sci Sports Exerc* 43: 1849-1856.
5. Skleryk JR, Karagounis LG, Hawley JA, Sharman MJ, Laursen PB, et al. (2013) Two weeks of reduced-volume sprint interval or traditional exercise training does not improve metabolic functioning in sedentary obese men. *Diabetes Obes Metab* 15: 1146-1153.
6. Frayn KN (1983) Calculation of substrate oxidation rates in vivo from gaseous exchange. *J Appl Physiol* 55: 628-634.
7. Cheneviere X, Malatesta D, Peters EM and Borrani F (2009) A mathematical model to describe fat oxidation kinetics during graded exercise. *Med Sci Sports Exerc* 41: 1615-1625.
8. Matthews DR, Hosker JP, Rudenski AS, Naylor BA, Treacher DF, et al. (1985) Homeostasis model assessment: insulin resistance and beta-cell function from fasting plasma glucose and insulin concentrations in man. *Diabetologia* 28: 412-419.
9. van Aggel-Leijssen DP, Saris WH, Wagenmakers AJ, Senden JM and van Baak MA (2002) Effect of exercise training at different intensities on fat metabolism of obese men. *J Appl Physiol* 92: 1300-1309.
10. Moro C, Bajpeyi S and Smith SR (2008) Determinants of intramyocellular triglyceride turnover: implications for insulin sensitivity. *Am J Physiol Endocrinol Metab* 294: E203-213.

Figures and Tables



**Figure 1.** Mean whole-body fat oxidation kinetics in absolute (A) and relative (B) values during Incr in pre-and post-training condition for both groups. Values are the means±SE. \$ p≤0.05 for differences for time effect.



**Figure 2.** Mean non-esterified fatty acids (NEFA) values during Incr in pre- and post-training condition for both groups. Values are the means  $\pm$  SE. \*  $p \leq 0.05$  for differences from pre-training for  $G_{Fatmax}$ ; £  $p \leq 0.05$  for differences for time x group effect for  $G_{Fatmax}$ .

**Table 1.** Effect of training on anthropometric measures, aerobic fitness and whole-body fat oxidation kinetics in both groups.

	Group Fat <sub>max</sub> (n = 10)		Group HIT (n = 8)		Significance		
	PRE	POST	PRE	POST	Group	Time	G x T
Age, yr	38.1 ± 2.3		37.0 ± 3.0				
Height, m	1.74 ± 0.02		1.76 ± 0.03				
Weight, kg	124.1 ± 4.5	120.4 ± 4.6	132.7 ± 5.4	128.5 ± 5.3	NS	0.001	NS
BMI, kg·m <sup>-2</sup>	40.9 ± 1.1	39.7 ± 1.1	42.8 ± 1.1	41.4 ± 1.1	NS	0.001	NS
Insulin, mU·L <sup>-1</sup>	28.7 ± 3.0	22.1 ± 2.6	22.7 ± 3.3	21.1 ± 3.8	NS	0.007	NS
Glucose, mmol·L <sup>-1</sup>	5.3 ± 0.1	5.2 ± 0.1	5.4 ± 0.2	5.2 ± 0.2	NS	NS	NS
HOMA-IR	6.7 ± 0.7	5.2 ± 0.7	5.4 ± 0.7	5.0 ± 1.0	NS	0.02	NS
<b>Exercise parameters</b>							
V'O <sub>2max</sub> , mL·min <sup>-1</sup>	2857 ± 151	2983 ± 166	3150 ± 113	3400 ± 128	NS	0.001	NS
V'O <sub>2max</sub> , mL·min <sup>-1</sup> ·kg <sup>-1</sup>	23.1 ± 1.2	24.9 ± 1.2	24.0 ± 1.3	26.7 ± 1.4	NS	0.001	NS
HR <sub>max</sub> , bpm	168 ± 5	172 ± 5	178 ± 5	177 ± 4	NS	NS	NS
<b>Whole body fat oxidation</b>							
MFO, mg·kg <sup>-1</sup> ·min <sup>-1</sup>	3.5 ± 0.3	3.8 ± 0.2	3.5 ± 0.2	4.1 ± 0.2	NS	0.006	NS
Fat <sub>max</sub> , %V'O <sub>2max</sub>	49.1 ± 2.6	52.6 ± 2.5	51.7 ± 2.9	54.4 ± 2.0	NS	NS	NS
<i>Dilatation</i>	0.0 ± 0.1	0.1 ± 0.1	0.1 ± 0.1	0.2 ± 0.1	NS	NS	NS
<i>Symmetry</i>	0.8 ± 0.1	0.9 ± 0.1	0.9 ± 0.0	1.0 ± 0.1	NS	0.04	NS
<i>Translation</i>	-0.2 ± 0.1	-0.2 ± 0.1	-0.2 ± 0.1	-0.1 ± 0.0	NS	NS	NS

Values are the means ± SE. BMI: body mass index; HOMA-IR: homeostasis assessment of insulin resistance; V'O<sub>2max</sub>: maximal oxygen uptake; HR<sub>max</sub>: maximal heart rate; Fat<sub>max</sub>: exercise intensity at which maximal fat oxidation rate (MFO) occurs; HIT: high-intensity interval training.

# Task dependent changes of corticospinal excitability during observation and motor imagery of postural tasks

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## **Abstract:**

### **Introduction:**

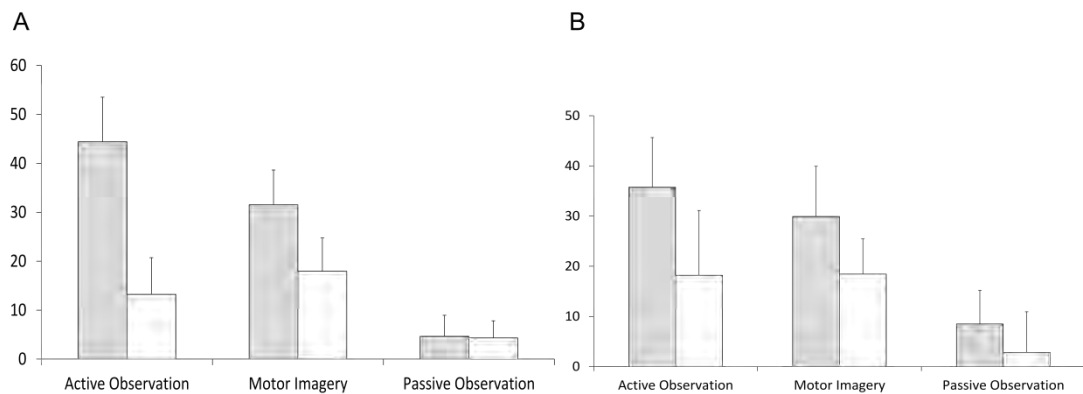
Postural control plays a fundamental role in daily life. Therefore, people who are at risk of falling (e.g. elderly people) are recommended to participate in physical balance training, in order to improve postural control and reduce the risk of falls. Nevertheless, physical balance training is not possible for temporarily immobilized people. Alternative, non-physical forms of training should therefore be considered. Namely, subjects may train postural tasks by motor imagery and/or action observation. Previously, Hamel & Lajoie (2005) and Tia (2010) demonstrated that both forms can improve postural control. In order to assess the underlying mechanisms, a recent functional Magnetic Resonance Imaging (fMRI) study (Taube, 2012) evaluated brain activity for static and dynamic postural tasks during active and passive action observation as well as motor imagery. Their results demonstrate significant activity in brain areas involved in balance control such as the supplementary motor area (SMA), cerebellum or putamen, most pronounced whilst observing and imaging the dynamic task. However, no activity was found in the primary motor cortex (M1) although this region is known to be important for static (Tokuno, Taube, & Cresswell, 2009) and dynamic postural control (Taube et al., 2006). As only few fMRI studies found M1 activity during motor imagery (e.g. (Sharma, Jones, Carpenter, & Baron, 2008)), this may be related to the method, i.e. the low temporal resolution of fMRI. To clarify this point, the present study applied the same study paradigm as the fMRI study of Taube (2012), but Transcranial Magnetic Stimulation (TMS) was used in order to clarify whether corticospinal excitability is affected during action observation and/or motor imagery of different postural tasks.

### **Methods:**

The study was conducted with fifteen participants (age  $27 \pm 4.6$ , five females). The experiment was consisted of three mental states: Motor Imagery (MI), Active and Passive Observation (AO and PO). In each mental state, two videos of a person performing a postural task were randomly displayed. One video showed a person standing on stable ground (STATIC), the other displayed the same person compensating a medio-lateral perturbation on a free-swinging platform (DYNAMIC). For MI, subjects were asked to

imagine the announced task from a first-person perspective with their eyes closed. The instructions for PO were to watch the video without making any mental effort, whereas during AO, the subjects were instructed to watch the video and imagine being the person in it. In summary, six experimental conditions, three MENTAL STATES (AO, PO, MI) and two POSTURAL TASKS (STATIC, DYNAMIC), were randomly presented to each subject. Between each experimental condition there was a rest period of 25sec. In each experimental condition and also during each rest period, motor evoked potentials (MEPs) were elicited by TMS. MEPs were recorded in the soleus and tibialis muscles. MEPs from the six conditions were normalized with MEPs of the corresponding rest period. A two-way repeated measure-ANOVA was executed for MEP amplitudes with MENTAL STATE (x3) and POSTURAL TASK (x2) as factors.

### Results:



**Figure 1:** Modulation of corticospinal excitability during the 6 experimental conditions from the (A) soleus and (B) tibialis muscles. White bars represent dynamic postural task, and gray bars indicate static postural task (\*  $p < 0.05$ ). In the soleus muscle, the data revealed significant main effects for MENTAL STATE ( $_{AO \times MI \times PO}$ ) ( $F_{2,28} = 6.3$ ;  $p < 0.01$ ), for POSTURAL TASK ( $_{Sta \times Dyn}$ ) ( $F_{1,14} = 12$ ;  $p < 0.01$ ), and for the interaction of MENTAL STATE and POSTURAL TASK ( $F_{2,28} = 5.14$ ;  $p = 0.013$ ). Means of MEP amplitudes from the tibialis muscle displayed a main effect for MENTAL STATE ( $_{AO \times MI \times PO}$ ) ( $F_{2,28} = 4.55$ ,  $p = 0.019$ ). Nevertheless, no main effect for POSTURAL TASK ( $_{Sta \times Dyn}$ ) ( $F_{1,14} = 1.59$ ,  $p = 0.23$ ) and no interaction of MENTAL STATE x POSTURAL TASK occurred ( $F_{2,28} = 0.241$ ,  $p = 0.79$ ).

### Discussion/Conclusion:

The purpose of this study was to evaluate if the corticospinal pathway is affected by different mental states (MI, AO, and PO) and different postural tasks. In summary, AO resulted in the largest facilitation of MEPs, followed by MI. In these two mental states, MEP facilitation was significantly larger in the dynamic perturbation than in the static standing task. In contrast, PO resulted in hardly any facilitation, independent of the task. Our study is the first which investigates action observation and motor imagery of postural tasks using TMS. Thus, the comparison with previous TMS studies investigating other muscles and



movements may have some limitations. Nevertheless, our results are in line with the general notion that corticospinal excitability is increased during MI and action observation (e.g. Fadiga, Fogassi, Pavesi, & Rizzolatti (1995)). Indeed, (Clark, Tremblay, & Ste-Marie 2004) also reported enhanced corticospinal excitability during action observation and MI but did not find significant differences between active and passive observation. However, the tasks that were presented for active and passive observation differed so that direct comparisons were not possible. Most similar to the present approach, Roosink et Zijdwind (2010) instructed subjects to use MI, PO and AO to mentally perform simple and complex hand tasks. They found that MEP size was significantly larger during AO than in MI and PO, respectively. In our case, the facilitation of MEPs during MI and AO was larger than during PO but no difference was apparent between MI and AO. Thus, both studies demonstrated that the mental state influences corticospinal processing and that PO and AO greatly differ. Furthermore, both studies indicate that task difficulty plays an important role. In the study of Roosink et Zijdwind (2010), MEP amplitudes were larger during complex than during simple tasks, independent of the mental state (AO, PO, MI). The current results showing greater facilitation in the more demanding dynamic task confirm these previous observations. Moreover, they are in line with fMRI studies showing increased cerebral blood flow in motor areas when imaging or observing complex instead of simple tasks (Kuhtz-Buschbeck et al., 2003; Taube, 2012).

In conclusion, our results demonstrate that both mental state and postural task difficulty influence corticospinal excitability, and propose that active observation as well as motor imagery of demanding postural tasks may be most beneficial to activate the corticospinal system and thus, train balance non-physically.

#### References:

- Clark, S., Tremblay, F., & Ste-Marie, D. (2004). Differential modulation of corticospinal excitability during observation, mental imagery and imitation of hand actions. *Neuropsychologia*, *42*(1), 105–112. doi:10.1016/S0028-3932(03)00144-1
- Fadiga, L., Fogassi, L., Pavesi, G., & Rizzolatti, G. (1995). Motor facilitation during action observation: a magnetic stimulation study. *Journal of Neurophysiology*, *73*(6), 2608–2611.
- Hamel, M. F., & Lajoie, Y. (2005). Mental imagery. Effects on static balance and attentional demands of the elderly. *Aging Clinical and Experimental Research*, *17*(3), 223–228.
- Kuhtz-Buschbeck, J. P., Mahnkopf, C., Holzknacht, C., Siebner, H., Ulmer, S., & Jansen, O. (2003). Effector-independent representations of simple and complex imagined finger movements: a combined fMRI and TMS study. *European Journal of Neuroscience*, *18*(12), 3375–3387. doi:10.1111/j.1460-9568.2003.03066.x

Roosink, M., & Zijdwind, I. (2010). Corticospinal excitability during observation and imagery of simple and complex hand tasks: Implications for motor rehabilitation. *Behavioural Brain Research*, 213(1), 35–41. doi:10.1016/j.bbr.2010.04.027

Sharma, N., Jones, P. S., Carpenter, T. A., & Baron, J.-C. (2008). Mapping the involvement of BA 4a and 4p during Motor Imagery. *NeuroImage*, 41(1), 92–99. doi:10.1016/j.neuroimage.2008.02.009

Taube, W. (2012). *Brain activity during observation (active and passive) and mental imagery of different postural tasks*. Poster session presented at the Society for Neuroscience, New Orleans, LA.

Taube, W., Schubert, M., Gruber, M., Beck, S., Faist, M., & Gollhofer, A. (2006). Direct corticospinal pathways contribute to neuromuscular control of perturbed stance. *Journal of Applied Physiology*, 101(2), 420–429. doi:10.1152/jappphysiol.01447.2005

Tia, B., Mourey, F., Ballay, Y., Sirandre, C., Pozzo, T., & Paizis, C. (2010). Improvement of motor performance by observational training in elderly people. *Neuroscience Letters*, 480(2), 138–142. doi:10.1016/j.neulet.2010.06.026

Tokuno, C. D., Taube, W., & Cresswell, A. G. (2009). An enhanced level of motor cortical excitability during the control of human standing. *Acta Physiologica*, 195(3), 385–395. doi:10.1111/j.1748-1716.2008.01898.x

**Title: Muscle weakness in young adults with cerebral palsy.**

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**Abstract:**

**Introduction:**

Cerebral palsy (CP), caused by a non-progressive perinatal brain lesion resulting in secondary muscle pathologies (1), has a prevalence of 2:1000 live births in Europe (7). Chronic fatigue is the most frequent debilitating symptom in CP in adults (2), and is associated with muscle weakness (3, 4, 11), and greatly reduced functional capacity. Muscle weakness seems caused by a combination of neural mechanisms such as increased coactivation levels (3, 6) associated with reduced motor drive (6, 10), and muscular mechanisms encompassing reduced muscle volume (3, 6), muscle fiber atrophy (8), disorganization of myofibrils (8) and fiber type switch (8).

At odds with the reported muscle weakness, several studies reported that CP patients might have greater resistance to muscle fatigue compared to healthy subjects (9). However, these studies were performed on children and although CP is a non-progressive disease, its manifestations may change from childhood to adulthood (5).

In order to disentangle between muscle weakness and increased fatigue resistance observed in CP, we assessed neuromuscular function of the plantar flexors in a fresh state (to describe and quantify muscle weakness) and after a fatiguing isometric contraction (to describe and quantify muscle fatigue).

**Methods**

*Subjects.* Eleven CP subjects (5 females,  $19.5 \pm 3.0$  yr,  $57.1 \pm 10.5$  kg,  $166.0 \pm 7.2$  cm) and 11 healthy control subjects (5 females,  $19.6 \pm 2.7$  yr,  $69.6 \pm 17.3$  kg,  $174.7 \pm 11.8$  cm) volunteered to participate in the study.

*Protocol.* Subjects performed a minimum of 2 maximal voluntary contractions (MVC) of 3-4 s with the plantar flexors and 1 MVC with the dorsiflexors. Subjects then performed a 10 s plantar flexor MVC, which was followed by a single electrical stimulation (potentiated twitch). The subjects then did a fatiguing task consisting of a 2 min sustained plantar flexor MVC interrupted each 30 s (for a period of 3 s) to evoke a twitch via supramaximal transcutaneous electrical stimulation of the tibial nerve. Within 2 to 3 s after the fatiguing task, another plantar flexor MVC was performed followed by a dorsiflexor MVC. All plantar flexor MVCs were superimposed and followed by tibial nerve stimulation.

*Data management.* Voluntary and evoked forces developed by the plantar flexors were recorded using an isometric ergometer (ankle and knee angles =  $90^\circ$ ; trunk-thigh angle =  $100^\circ$ ). Surface electromyography (EMG) activity was recorded from the *soleus* (Sol), *gastrocnemius lateralis* (GL), *gastrocnemius medialis* (GM) and *tibialis anterior* (TA) muscles and analyzed as root mean square (RMS) (taken 0.5s around peak force for the 3-4 MVCs and averaged over each 30s of the fatiguing task). RMS values were normalized to RMS of the MVC performed in a fresh state (i.e.

RMSmax). M-wave amplitudes were also assessed. Antagonist coactivation was calculated as the RMS obtained during the MVC where the muscle acted as an antagonist divided by the RMS obtained from the MVC where the muscle acted as an agonist. Voluntary activation level (VAL) was calculated as  $VAL = (1 - \text{superimposed twitch}/\text{resting twitch}) \times 100$ .

#### Statistics.

Two way repeated measures ANOVAs were performed [time (pre vs. post) or (first 30s vs. last 30s of sustained MVC) x group (CP vs. control)] for all parameters. The Holm-Sidak *post-hoc* test was used to test for differences between means.  $\alpha$  was set to  $p < 0.05$ . Data are presented as mean  $\pm$  SD.

Three CP subjects could not produce reliable MVC and three did not bear electrical stimulation and were thus discarded (with their matching control) from corresponding analysis.

## Results

### Fresh state.

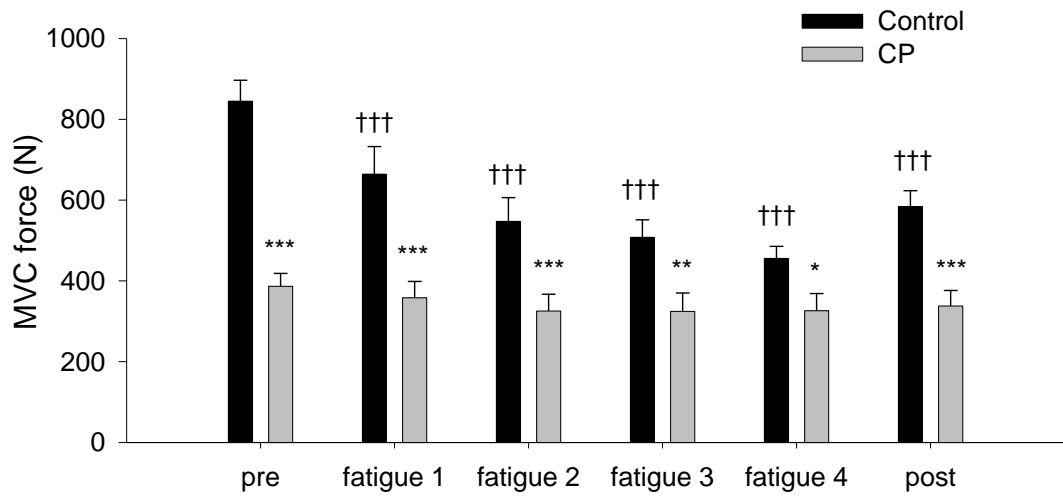
MVC force was lower in CP compared to controls ( $p < 0.001$ , Fig.1). VAL was not different between the 2 groups ( $73.1 \pm 19.8\%$  in CP vs.  $85.3 \pm 10.1\%$  in controls,  $p > 0.05$ ). TA antagonist coactivation was higher in CP compared to controls ( $48.5 \pm 31.5\%$  RMSmax in CP vs.  $12.8 \pm 6.2\%$  RMSmax in controls,  $p < 0.01$ ). No differences between groups were observed in M-wave amplitudes ( $p > 0.05$ ). The potentiated twitch was lower in CPs compared to controls ( $91.7 \pm 25.0$  N vs.  $216.9 \pm 46.2$  N respectively,  $p < 0.001$ , Fig. 2).

### Fatigued state.

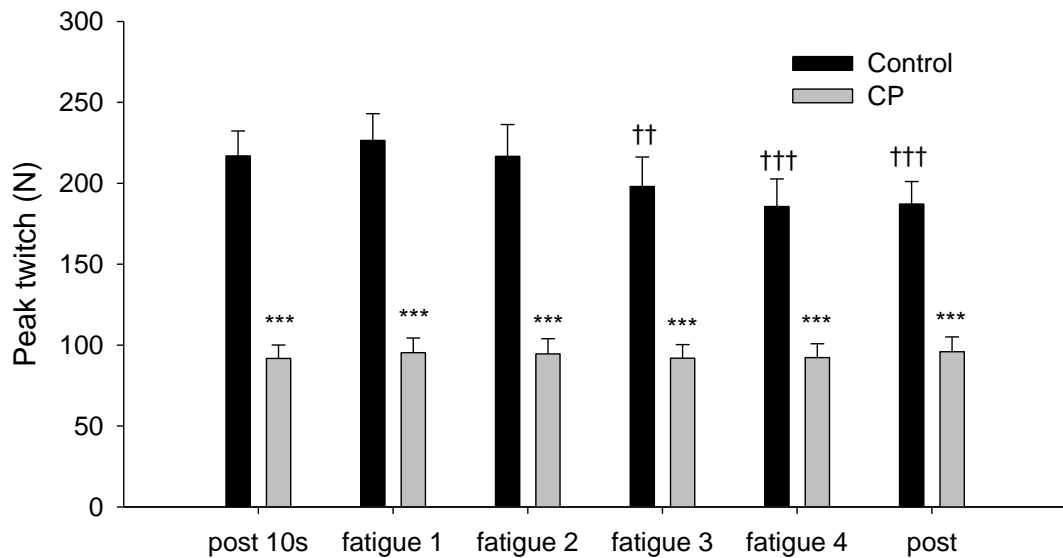
The MVC force was reduced in controls after the 2 min sustained MVC ( $-29.8 \pm 13.3\%$ ,  $p < 0.001$ , Fig.1) but was not significantly altered in CP ( $-13.1 \pm 12.1\%$ ,  $p > 0.05$ , Fig.1). Accordingly, MVC force during the fatiguing task decreased only in controls ( $p < 0.001$ , Fig. 1).

VAL loss tended to be greater in controls ( $p = 0.091$ ) compared to CP as it was reduced to  $67.2 \pm 10.8\%$  in controls and to  $69.6 \pm 12.3\%$  in CP ( $p < 0.05$ ). Further, Sol RMS decreased to  $77.6 \pm 21.6\%$  RMSmax in controls but only to  $91.7 \pm 24.9\%$  RMSmax in CP ( $p < 0.05$ ) while no changes were observed for GL and GM.

After the fatiguing task, Sol and GL M-wave amplitudes were reduced compared to the post 10s MVC M-wave amplitudes (Sol:  $-8.5 \pm 9.5\%$  and GL:  $-5.4 \pm 12.4\%$ ,  $p < 0.05$ ) with no differences between the 2 groups ( $p > 0.05$ ). No changes were observed in GM M-wave amplitude ( $p > 0.05$ ). Peak twitch value decreased in controls when compared to the unfatigued fully potentiated twitch ( $-7.9 \pm 9.9\%$ ,  $p < 0.001$ , Fig. 2) but was unchanged in CPs ( $-5.0 \pm 13.9\%$ ,  $p > 0.05$ , Fig. 2). Similarly, peak twitch diminished only in controls during the fatiguing task ( $-18.2 \pm 11.0\%$ ,  $p < 0.001$ , Fig. 2).



**Figure 1. MVC force before, during and after the fatiguing task.** Pre = before, fatigue 1-4 = the four periods of 30s of the fatiguing task and post = 3s after the fatiguing task. \*, \*\*, \*\*\* ( $p < 0.05$ ,  $p < 0.01$  and  $p < 0.001$ , respectively) indicate a significant difference between groups and ††† ( $p < 0.001$ ) indicates difference with pre.



**Figure 2. Peak twitch force before, during and after the fatiguing task.** Post 10s = Peak twitch sent after the 10s MVC before the fatiguing task, fatigue 1-4 = the four periods of 30s of the fatiguing task, post = after the fatiguing task. \*\*\* ( $p < 0.001$ ) indicates a significant difference between groups; †† and ††† ( $p < 0.01$ ,  $p > 0.001$ ) indicate difference with post 10s.

### Discussion/Conclusion

The present study was designed to get further insights into neuromuscular adjustments in young adults with CP in comparison to age and sex-matched controls. Our results showed that CP patients were weaker than their peers, confirming previous studies (3, 4, 11) conducted on younger CP patients. This reduced muscle

force appears to be mainly caused by a reduced muscle force associated with an increase in antagonist coactivation. Similar results were observed by Hussain et al. (6) who assessed the neuromuscular function of young adult hemiplegic CP young adults. On the other hand, in contrast to controls who presented neuromuscular fatigue caused by both neural and muscular mechanisms, CP patients appeared to be more fatigue resistant, as no MVC force, peak twitch force nor RMSmax reductions were observed during or after the fatiguing task. Additionally, motor drive tended to be more compromised in controls compared to CP patients. This improved fatigue-resistance observed in CP might suggest that CP patients present a greater proportion of type I fibers compared to their control peers, in agreement with Marbini et al. (8).

### Acknowledgement

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### References:

1. **Barrett RS, and Lichtwark GA.** *Dev Med Child Neurol* 52: 794-804, 2010.
2. **Brouwer B, Wheeldon R, Stradiotto-Parker N, and Allum J.** *Dev Med Child Neurol* 40: 168-175, 1998.
3. **Elder G, Kirk J, Stewart G, Cook K, Weir D, Marshall A, and Leahey L.** *Dev Med Child Neurol*: 2003, p. 542-550.
4. **Engsberg JR, Ross SA, Olree KS, and Park TS.** *Dev Med Child Neurol* 42: 42-47, 2000.
5. **Houlihan CM.** *Dev Med Child Neurol* 51: 338-339, 2009.
6. **Hussain AW, Onambele GL, Williams AG, and Morse CI.** *Muscle Nerve* 49: 76-83, 2014.
7. **Johnson A.** *Dev Med Child Neurol*: 2002, p. 633-640.
8. **Marbini A, Ferrari A, Cioni G, Bellanova MF, Fusco C, and Gemignani F.** *Brain Dev* 24: 63-66, 2002.
9. **Moreau NG, Li L, Geaghan JP, and Damiano DL.** *Arch Phys Med Rehabil* 89: 2011-2016, 2008.
10. **Rose J, and McGill KC.** *Dev Med Child Neurol* 47: 329-336, 2005.
11. **Wiley ME, and Damiano DL.** *Dev Med Child Neurol* 40: 100-107, 1998.

**Abstractvorlage für den Nachwuchspreis; 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg**

**Title:** Assessment of skeletal age on the basis of DXA-derived hand scans in elite youth soccer players

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**Abstract:**

**Introduction:**

In youth sports, grouping by chronological age (CA) is the usual procedure for separating young athletes into age-related training and competition groups. However, individuals in the same age category can differ by as much as four years in skeletal age (SA) (Malina et al., 2000). Due to the inherent variability, the maturity of young athletes is a crucial issue in talent selection (Malina, Bouchard, & Bar-Or, 2004). Therefore, modern models of talent identification and development try to use the maturation characteristics of young athletes in the selection process (Reilly, Williams, Nevill, & Franks, 2000). SA is said to be the most accurate indicator for assessing biological maturity (Malina, et al., 2004). The main problem with X-ray imaging in the talent identification process is the exposure to radiation (Kleinerman, 2006). In modern technology, the assessment of SA by hand–wrist radiography requires 1  $\mu$ Sv of radiation, which is the equivalent of less than four hours of natural background radiation or ten minutes on an intercontinental flight (Mettler, Huda, Yoshizumi, & Mahesh, 2008). Dual-energy X-ray absorptiometry (DXA) is the most commonly used bone densitometric technique used for children worldwide. The main advantages of this technique are low cost, high precision, speed, availability, and safety. DXA-derived hand–wrist scans have recently become available, and using DXA measurements to assess SA has been suggested as an approach to adjust for factors related to growth and puberty (Gordon et al., 2008). Evaluating SA via hand–wrist radiographs using DXA produces a 10-fold lower effective dose (1  $\mu$ Sv) than using X-ray (0.1  $\mu$ Sv), with results that appear to be comparable to those of standard radiographs (Gordon, et al., 2008). Until now, the applicability of DXA scans for assessing SA in youth athletes has not been validated. Therefore, the aim of the present study was to validate DXA as a technique for assessing SA and classifying the maturity of soccer players under 15 years of age.

**Methods:**

Participants were recruited among all soccer players who were invited to the national selection day of the Swiss Soccer Association. All 72 players were offered participation in the study by one of the authors, who was the leader of the project. The cross-sectional sample included 63 (87.5%) participants who decided to participate in the study. Paired X-ray and DXA scans of the left hands of 63 Swiss U-15 elite soccer players were performed, and SA assessments were then compared between the two techniques. SA and maturity assessments were performed twice by two blinded raters. SA was assessed by comparing the maturity indicators on each participant's X-ray or DXA scan to the standardised reference pictures according to the TW3 RUS method (Tanner, Healy, Goldstein, & Cameron, 2001). SA was assessed with a maximum precision of 0.1years. The players were classified as early, on time (average), or late maturing on the basis of the difference between SA and CA with each technique. On time was defined as an SA within 1.0 year of CA. Early maturing was defined as an SA older than CA by more than 1.0 year. Late maturing was defined as an SA younger than CA by more than 1.0 year. corresponding to previous studies that used SA to classify youth athletes into maturity categories (Malina, Coelho, Figueiredo, Carling, & Beunen, 2012). To compare the two techniques of assessing SA, we used the statistical methods described by Bland and Altman (Bland & Altman, 1999). Intrarater and interrater reliability were analysed using intraclass correlation coefficients (ICC) with a 95% confidence interval (CI). Values of less than 0.40 indicated poor reliability, values of 0.40–0.60 indicated fair reliability, values of 0.60–0.75 indicated good reliability, and values greater than 0.75 indicated excellent reliability. Then, Bland–Altman plots were used to visualise the differences between the X-ray and DXA scans and their distribution. We calculated the mean, the mean difference in years and in percentage, standard deviation (SD) of the mean difference, 95% limits of agreement (LoA), and standard error of estimate (SEE). In accordance with previous studies, we decided to accept the mean difference between the two techniques to deviate a

maximum of 5% from the mean of both techniques and to accept LoA within a range of  $\pm 1$  year (Malina, Coelho, Figueiredo, Carling, & Beunen, 2012). Kappa coefficients ( $\kappa$ ) and proportions of agreement ( $p_0$ ) were calculated to estimate the agreement between the two classifications (Kundel & Polansky, 2003).

**Results:**

The intrarater reliabilities of both raters were excellent; both had ICCs of 0.98 using X-ray and ICCs of 0.97 and 0.95 using DXA. The interrater reliabilities of both raters were also excellent, with an ICC of 0.93 using X-ray and an ICC of 0.95 using DXA. Bland–Altman plots showed that the SA assessments of the two raters differed by 0.2 and -0.1 years between X-ray and DXA. The SEEs were 0.33 years and 0.46 years, respectively. The 95% LoA of 0.64 and 0.90 years were within the acceptable tolerance of 1.0 year. Maturity status classifications were based on SA-CA and analysed for both raters (R). R1 classified 14 players as early, 39 as normal and 10 as late using the data of X-Ray and classified 11 players as early, 38 as normal and 14 as late using the data of DXA. R2 classified 20 players as early, 30 as normal and 13 as late using the data of X-Ray and classified 18 players as early, 31 as normal and 14 as late using the data of DXA. Concordance between assessments of R2 showed proportions of agreement of 0.86 (0.77-0.94) and  $\kappa = 0.77$ . Values of R1 and R2 represented good agreement between assessments analysed by X-ray and DXA.

**Discussion/Conclusion:**

We observed excellent intrarater and interrater reliability for SA assessments using X-ray and DXA. Agreement between SA assessments performed by DXA and X-ray was excellent as well. The Bland–Altman plots, proportions of agreement, and kappa statistics showed good agreement between maturity classifications in a youth sports setting. The mean difference between the assessments was -1.1% and 0.4% and did not deviate more than 5% from the mean of both techniques. Therefore DXA offered a replicable technique for assessing SA in youth soccer players. Results were similar in accuracy to those obtained by X-ray. Altogether DXA seems to be an acceptable alternative technique for assessing SA and classifying maturity in elite sports. A disadvantage of using DXA for assessing SA is that the resolution of the DXA scan is lower than X-ray, and the scanning procedure is more time consuming. The major advantage of the DXA technique compared with the classical X-ray technique is a 10-fold lower exposure to radiation.

**References:**

Bland, J. M., & Altman, D. G. (1999). Measuring agreement in method comparison studies. *Statistical methods in medical research*, 8(2), 135-160.

Gordon, C. M., Bachrach, L. K., Carpenter, T. O., Crabtree, N., El-Hajj Fuleihan, G., Ward, L. M. (2008). Dual energy X-ray absorptiometry interpretation and reporting in children and adolescents: the 2007 ISCD Pediatric Official Positions. *Journal of Clinical Densitometry*, 11(1), 43-58.

Kleinerman, R. A. (2006). Cancer risks following diagnostic and therapeutic radiation exposure in children. *Pediatric Radiology*, 36(2), 121-125.

Kundel, H. L., & Polansky, M. (2003). Measurement of Observer Agreement1. *Radiology*, 228(2), 303-308.

Malina, R., Bouchard, C., & Bar-Or, O. (2004). *Growth, maturation, and physical activity* (2nd ed.). Champaign: Human Kinetics.

Malina, R. M., Coelho, E. S. M. J., Figueiredo, A. J., Carling, C., & Beunen, G. P. (2012). Interrelationships among invasive and non-invasive indicators of biological maturation in adolescent male soccer players. *J Sports Sci*, 30(15), 1705-1717.

Malina, R. M., Reyes, M. E. P., Eisenmann, J. C., Horta, L., Rodrigues, J., & Miller, R. (2000). Height, mass and skeletal maturity of elite Portuguese soccer players aged 11–16 years. *Journal of Sports Sciences*, 18(9), 685-693.

Mettler Jr, F. A., Huda, W., Yoshizumi, T. T., & Mahesh, M. (2008). Effective Doses in Radiology and Diagnostic Nuclear Medicine: A Catalog1. *Radiology*, 248(1), 254-263.

Reilly, T., Williams, A. M., Nevill, A., & Franks, A. (2000). A multidisciplinary approach to talent identification in soccer. *J Sports Sci*, 18(9), 695-702.

Tanner, J., Healy, M., Goldstein, H., & Cameron, N. (2001). Assessment of skeletal maturity and prediction of adult height (TW3). *WB Saunders*, London.



**Abstractvorlage für den Nachwuchspreis; 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg**

**Title:**

Do Improved Coping Skills Mediate the Effects of a Physical Education based Coping Training on Adolescents' Stress Perceptions?

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**Abstract:**

**Introduction:**

Although most adolescents successfully manage the transition from childhood to adulthood, the velocity and magnitude of these changes may exceed their coping abilities (Gerber & Pühse, 2008). For vocational students, additional responsibilities arise from the transition to a vocational school and the need to balance academic and job-related requirements (Narring et al., 2004). Despite these insights, research on the relationship between stress and coping among vocational students is scarce. This is surprising, given that in Switzerland 74% of all secondary school diplomas are granted to vocational students (OECD, 2012).

As emphasized by cognitive-transactional stress models (Lazarus & Folkman, 1984), it is not exclusively the exposure to stressful circumstances that constitutes a health risk. Rather, several appraisal processes and the availability of skills and resources to cope with stress impact on health. Therefore, building up a broad and balanced coping repertoire is key to fostering adolescents' resilience.

The majority of school-based coping trainings (e.g. de Anda, 1998; Beyer, 2005; Hampel et al., 2008) are based on theoretical education in a classroom setting. In contrast, physical education (PE) has the potential to integrate both theoretical and practical experiences of stress. This approach incorporates the idea of experiential learning, in which the learning process occurs through action and reflection on "doing" (Kolb, 1984). If students get confronted with stressful or apparently unsolvable tasks in PE, they need to apply appropriate coping skills. In a short reflection following the tasks, experiences of adaptive and maladaptive coping strategies can be discussed. Furthermore, reflecting students' individual stress responses could be a useful way to increase student sensitivity for mental hygiene. Thus far, no empirical evidence exists supporting the hypothesis that PE constitutes a setting to purposely foster adolescent coping skills.

Given this background, the main goal of the current project was to develop, implement and evaluate a PE based coping training (EPHECT) in a vocational education setting. First, it was hypothesized that the coping training will result in moderate improvements regarding adolescents' self-reported coping skills as the most proximal outcome (Hampel et al., 2008). Second, the intervention will also lead to reduced stress perceptions. With regard to Hypothesis 2, we expected only weak influences post intervention, because positive effects of primary prevention programs are often visible only in the long-term (Fridrici & Lohaus, 2007). However, increased coping skills may primarily be a result of knowledge gain (Beyer, 2005). Therefore, we assumed that reduced stress perception as a long-term outcome of the intervention program is mediated through improved coping (Hypothesis 3).

**Methods:**

*Participants and Procedure:* A total of 146 students from eight classes were selected ( $M_{age} = 16.22$ ,  $SD = 1.12$ , 35.2% females). Four classes were randomly assigned to the EPHECT coping training ( $n = 67$ ;  $M_{age} = 15.96$ ,  $SD = 1.04$ , 32.4% females). The other four classes ( $n = 79$ ;  $M_{age} = 16.44$ ,  $SD = 1.09$ , 31.7% females) received conventional PE lessons. Complete baseline and follow-up data were available from 112 students (IG:  $n = 56$ ; CG:  $n = 56$ ). There was a dropout from baseline to follow-up of 23%.

Dropout and intention to treat analysis (LOCF) from t1 to t3 revealed no significant differences for age, gender and outcome variables. To determine the effectiveness of the program, all students completed three series of questionnaires related to coping and stress. Baseline data were collected in

August 2012 (t1), post intervention data in November 2012 (t2), and follow-up in June 2013 (t3). All participants completed the questionnaires during class hours.

*Measures:* Information about students' sociodemographic background was collected in the first section of the questionnaire. Coping skills were assessed with the *Stressverarbeitungs-Fragebogen für Kinder und Jugendliche (SVF-KJ)* (Hampel, Petermann, & Dickow, 2001). In the present sample, the Cronbach's alphas were  $\alpha = .75$  for adaptive, and  $\alpha = .86$  for maladaptive coping. Perceived stress was assessed with the *Adolescents Stress Questionnaire (ASQ)* (Byrne, Davenport, & Mazanov, 2007). The Cronbach's alpha in the present sample was high ( $\alpha = .90$ ).

*Statistical Analysis:* Between-group differences at baseline were tested with univariate analyses of variance (ANOVAs). Time (t1 vs. t2 and t2 vs. t3) by group (CG vs. IG) interaction effects were tested with repeated measures ANCOVAs, with age as covariate. Whether coping skills at t2 have a mediating influence on perceived stress at t3 was tested via path model, using AMOS 22.0.

### Results:

Univariate ANCOVAs revealed that both groups did not differ in the baseline scores of the outcome variables ( $p > .05$ ). Repeated measures ANOVAs show no significant main effect for time. A significant time by group interaction effect (pre vs. post) was observed for adaptive coping, with improved skills in the IG,  $F(1,111) = 4,22, p < .05, \eta^2 = .037$ . No statistically significant interaction effects were found for the other outcome variables ( $p > .05$ ). However, while post intervention adaptive and maladaptive coping skills remained relatively stable for the next six months (post vs. follow-up), a significant time by group interaction effect was observed for perceived stress,  $F(1,111) = 3,82, p < .05, \eta^2 = .034$ , with decreased stress in the IG (Figure 1). The results of the path model indicate that post intervention coping was more predictive of perceived stress at the six months follow-up, than the direct link between the intervention and stress at follow-up (Figure 2). The overall goodness of fit indices suggest that the proposed model provides a good fit to the data, GFI = .93, AGFI = .96, TLI = 1.00, CFI = 1.00, RMSEA = .00 (.00, .13).

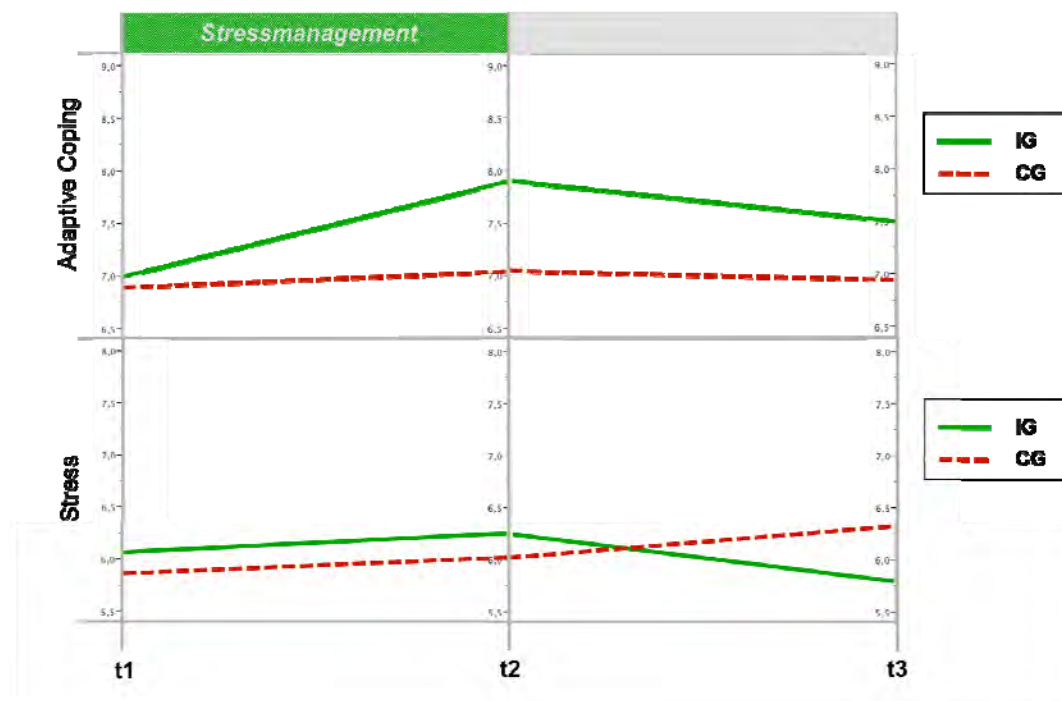


Figure 1. Results of the intervention from baseline to follow-up on coping and stress.

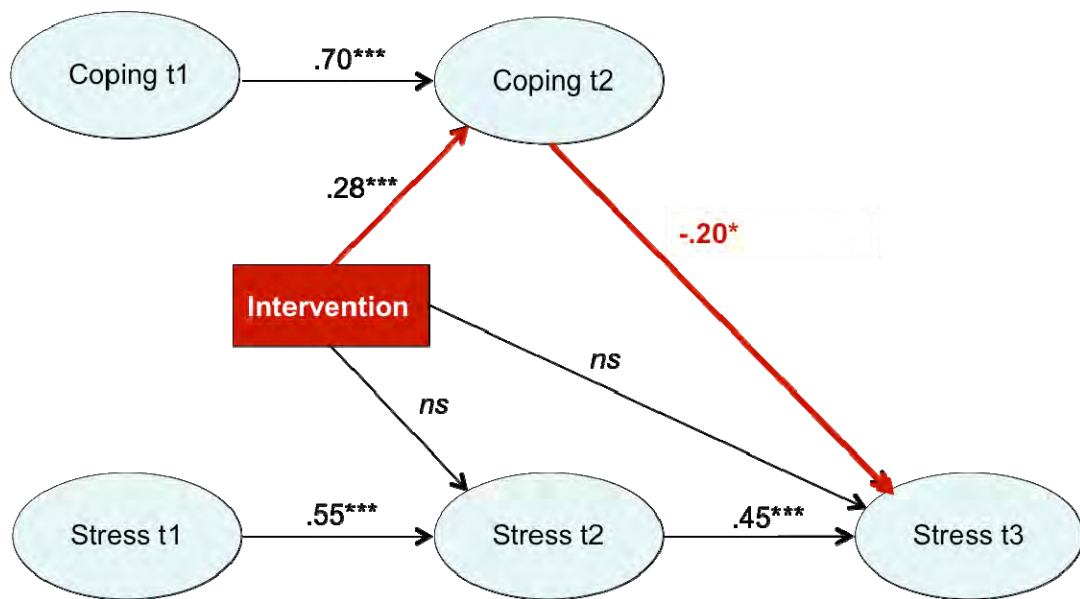


Figure 2. Hypothesized path model and factor loadings.

#### Discussion/Conclusion:

It was assumed that coping training would promote more adaptive and less maladaptive coping. A significant Time by Group interaction effect showed that students of the IG improved their adaptive coping skills more compared to students of the CG. No effect was found for maladaptive coping and stress perception, which remained stable over time. Although speculative, we assume the EPHECT coping training led to a gain in knowledge and awareness (Beyer, 2005). Thus, while adaptive coping skills improved, IG students might have become more sensitive to maladaptive coping skills and stress symptoms. Moreover, stress is a more distant outcome, which depends on factors that are difficult to influence directly through a school prevention program (e.g. work environment, family climate). Fridrici and Lohaus (2007) argued that reducing stress and improving health should not be the primary focus of primary prevention programs. Rather, preventive interventions should seek to foster protective factors to increase participants' resilience resources, and to reduce the likelihood of negative outcomes. Thus, having an appropriate coping repertoire may help to reduce the long-term risk for stress-related diseases (Grant et al., 2004). In this respect, the supporting findings for the hypothesized mediation between the intervention and stress perception at six months follow-up through coping are very promising.

#### References:

- Beyer, A. (2005). *Konzeption und Evaluation eines Stresspräventionstrainings für Jugendliche [Conceptualization and evaluation of a stress prevention training for adolescence]*. Marburg: University of Marburg.
- Byrne, D. G., Davenport, S. C., & Mazanov, J. (2007). Profiles of adolescent stress: the development of the adolescent stress questionnaire (ASQ). *Journal of Adolescence, 30*, 393-416.
- de Anda, D. (1998). The Evaluation of a Stress Management Program for Middle School Adolescents. *Child and Adolescent Social Work Journal, 15*, 73-85.
- Fridrici, M., & Lohaus, A. (2007). Stressprävention für Jugendliche: Verbessert ein begleitendes e-Learning-Angebot die Effekte eines Trainingsprogramms? [Stress prevention in adolescence: Does an accompanying e-learning-system improve the outcomes of a training program?]. *Zeitschrift für Gesundheitspsychologie, 15*, 95-108.

- Gerber, M., & Pühse, U. (2008). "Don't crack under pressure"-Do leisure time physical activity and self-esteem moderate the relationship between school-based stress and psychosomatic complaints? *Journal of Psychosomatic Research*, 65, 363-369.
- Grant, K. E., Compas, B. E., Thurm, A. E., McMahon, S. D., & Gipson, P. Y. (2004). Stressors and child and adolescent psychopathology: measurement issues and prospective effects. *Journal of Clinical Child & Adolescent Psychology*, 33, 412-425.
- Hampel, P., Meier, M., & Kümmel, U. (2008). School-based stress management training for adolescents: Longitudinal results from an experimental study. *Journal of Youth and Adolescence*, 37, 1009-1024.
- Hampel, P., Petermann, F., & Dickow, B. (2001). *SVF-KJ. Stressverarbeitungsfragebogen von Janke und Erdmann angepasst für Kinder und Jugendliche*. Göttingen: Hogrefe.
- Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, N.J.: Prentice-Hall, Inc.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- Narring, F., Bükülmez, M., & Université de Lausanne. Institut universitaire de médecine sociale et préventive. (2004). *Gesundheit und Lebensstil 16- bis 20-Jähriger in der Schweiz (2002): SMASH 2002, Swiss multicenter adolescent survey on health 2002*. Lausanne: Institut universitaire de médecine sociale et préventive.
- OECD. (2012). *Education at a Glance 2012. OECD Indicators*. Paris: OECD Publishing.

## Abstract für den Nachwuchspreis; 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg

### **Titel:**

Befindlichkeitsveränderungen bei aerober Beanspruchung in Seniorensportkursen – eine Überprüfung der Dual Mode Theorie

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### **Abstract:**

#### **Einleitung:**

Der Gesundheitsnutzen von Sport ist gut dokumentiert, dennoch sind 55% der über 65-Jährigen in der Schweiz zu wenig aktiv (Bundesamt für Sport, 2013; Bundesamt für Statistik, 2010). Als bedeutsam für ein regelmässiges Sportverhalten betrachten Ekkekakis, Parfitt und Petruzzello (2011) positive Befindlichkeitsveränderungen beim Sporttreiben. Diese Veränderungen sind gemäss der Dual Mode Theorie (Ekkekakis, 2003) belastungsbedingt und weisen interindividuelle Unterschiede auf. Die Dual Mode Theorie postuliert, dass bei aeroben Belastungen positive Befindlichkeitszustände und homogene Veränderungen, bei Intensitäten im aerob-anaeroben Übergangsbereich heterogene Befindlichkeitszustände und -veränderungen und bei Belastungen über der anaeroben Schwelle negative Befindlichkeitszustände und homogene Veränderungen auftreten.

Betreffend der bevorzugten Belastungsintensität kommen King, Haskell, Taylor, Kraemer und DeBusk (1991) zum Schluss, dass ältere Erwachsene moderate Intensitäten beim Sporttreiben bevorzugen. In Metaanalysen (z. B. Arent, Landers & Etnier, 2000) zeigten sich im höheren Erwachsenenalter die stärksten Befindlichkeitseffekte bei niedrigen bis moderaten Intensitäten im aeroben Bereich. Die Dual Mode Theorie deckt den moderaten Belastungsbereich mit einer einzigen Kategorie ab und differenziert nicht weiter in niedrige und moderate Intensität wie Arent et al. (2000). Dies resultiert insbesondere daraus, da die Erkenntnisse der Dual Mode Theorie auf Laboruntersuchungen, meist mit jungen Studierenden oder Sportlern basieren, welche v. a. Ausdauerbelastungen im Bereich an und über der aeroben Schwelle absolviert haben (z. B. Acevedo, Kraemer, Haltom & Tryniecki, 2003). Im Bereich von Seniorensportkursen mit polysportiven Inhalten im aeroben Bereich liegen keine Feldstudien zu belastungsbedingten Befindlichkeitsveränderungen vor. Daher und im Hinblick auf eine langfristige Sportteilnahme analysiert dieser Beitrag diese Thematik aus einer differenziellen Perspektive und überprüft die Annahmen der Dual Mode Theorie. Konkret wird untersucht, wie sich die aktuelle Befindlichkeit im Verlauf von Seniorensportkursen verändert und inwiefern interindividuelle Unterschiede während aeroben Beanspruchungen auftreten und ob allenfalls eine weitere Differenzierung der Dual Mode Theorie in niedrige und moderate Belastung notwendig ist.

#### **Methodik:**

Im Rahmen des Projekts „Welcher Sport passt zu mir?“ des Instituts für Sportwissenschaft der Universität Bern wurden die Passungsverhältnisse zwischen individuellen Handlungsvoraussetzungen und sportlichen Erscheinungsformen im höheren Erwachsenenalter untersucht und die Auswirkungen auf die Befindlichkeit der Zielgruppe analysiert. Dieser Beitrag ist Teil dieses Projekts, welches finanziell von der Stiftung Suzanne und Hans Biäsch zur Förderung der Angewandten Psychologie unterstützt wurde. In dieser Feldstudie wurden von Januar bis Oktober 2013 in Kooperation mit der Pro Senectute Region Bern 23 Seniorensportkurse besucht. Es wurde die aktuelle Befindlichkeit vor, während und nach dem Kurs und die wahrgenommene Beanspruchung während und nach dem Kurs schriftlich erfragt.

Zur Erfassung der aktuellen Befindlichkeit wurde eine Kurzsкала von Wilhelm und Schoebi (2007) eingesetzt. Diese umfasste sechs bipolare Ratingfragen zu den drei Basisdimensionen Valenz, positive Aktivierung und Ruhe. Die Aussage „In diesem Moment fühle ich mich...“ wurde mit einer siebenstufigen Antwortskala von 1 (z. B. „sehr müde“) bis 7 (z. B. „sehr wach“) bewertet. Die theoriebasierte, dreidimensionale Struktur der Befindlichkeit konnte faktoranalytisch nicht abgebildet werden, daher wurde für die Analysen jeweils der Befindlichkeitsmittelwert gebildet.

Die wahrgenommene Beanspruchung wurde mit einer deutschsprachigen Version der CR10-Skala von Borg (1998) erfasst. Für die Analysen wurde der aerobe Belastungsbereich, gestützt auf Nelson et al. (2007), auf Borg-Werte auf der CR10-Skala von  $\leq 6$  festgelegt. Für differenziertere Auswertungen wurde dieser weiter, basierend auf Borg und Kaijser (2006), in eine niedrige ( $\leq 2$ ) und eine moderate Beanspruchungskategorie ( $2 < \text{Wert} \leq 6$ ) unterteilt.

Insgesamt konnten Befindlichkeits- und Beanspruchungsdaten von 135 Personen ( $M = 72.2$  Jahre;  $SD = 5.1$  Jahre; 70% Frauen) erfasst werden. Als Folge der Datenüberprüfung mussten 11 Personen (10 Ausreisser, 1 Beanspruchung  $> 6$ ) gelöscht werden.

Zur Analyse der Befindlichkeitsveränderungen im Verlauf von Seniorensportkursen wurden Varianzanalysen mit Messwiederholung durchgeführt. Für die Bewertung wurden Effektstärken berechnet, wobei gemäss Cohen (1992) ein partielles  $\eta^2 = .01$  als kleiner Effekt,  $\eta^2 = .06$  als mittlerer Effekt und  $\eta^2 = .14$  als grosser Effekt eingestuft werden können.

Zur Beurteilung der belastungsbedingten, interindividuellen Unterschiede wurden einfache Differenzwerte des Befindens während der sportlichen Aktivität im Vergleich zu davor berechnet und drei Kategorien gebildet: positive Veränderung (Differenzwert  $> 0.33$ ), keine Veränderung ( $-0.33 \leq \text{Differenzwert} \leq 0.33$ ) und negative Veränderung (Differenzwert  $< -0.33$ ).

### Ergebnisse:

Hinsichtlich der Veränderung der Befindlichkeit im Verlauf von Seniorensportkursen zeigt sich, dass bei allen drei Messzeitpunkten hohe Befindlichkeitsmittelwerte verzeichnet werden und erwartungskonform eine Verbesserung von vor ( $M_{\text{vor}} = 5.45$ ) zu während ( $M_{\text{während}} = 5.73$ ) zu nach ( $M_{\text{nach}} = 5.89$ ) der Sportaktivität stattfindet [Pillai-Spur = .25,  $F(1.72, 211.27) = 28.65$ ,  $p < .0005$ ]. Die Effektstärke zeigt einen grossen Effekt der Zeit ( $\eta^2 = .19$ ). Die Paarvergleiche (Helmert-Kontrast) offenbaren ebenfalls statistisch überzufällige Unterschiede [vor vs. spätere:  $F(1, 123) = 37.42$ ,  $p < .0005$ ,  $\eta^2 = .23$ ; während vs. nach:  $F(1, 123) = 11.362$ ,  $p = .001$ ,  $\eta^2 = .09$ ].

In Bezug auf die interindividuellen Unterschiede in den Befindlichkeitsveränderungen während aerober Belastung weisen 36% eine positive, 52% keine und 12% eine negative Befindlichkeitsveränderung auf. Aufgrund der allgemein hohen Befindlichkeitsmittelwerte vor dem Kurs, kann keine Veränderung auch als positiv zu bewertende Reaktion betrachtet werden. Daher ist abschliessend festzuhalten, dass die Teilnehmenden während Seniorensportkursen erwartungskonform eine positive aktuelle Befindlichkeit aufweisen und bei aeroben Belastungen die Befindlichkeitsveränderungen homogen und positiv ausfallen.

Für eine differenziertere Analyse der Wirkung von aeroben Belastungen auf die Befindlichkeit wurden zwei Beanspruchungskategorien gebildet. Im Vergleich dieser, zeigt die niedrige Beanspruchungsgruppe ( $n = 64$ ;  $M_{\text{vor}} = 5.66$ ,  $SD_{\text{vor}} = 0.82$ ;  $M_{\text{während}} = 6.04$ ,  $SD_{\text{während}} = 0.77$ ) zu beiden Messzeitpunkten einen jeweils höheren Mittelwert mit einer kleineren Streuung als die moderate Beanspruchungsgruppe ( $n = 60$ ;  $M_{\text{vor}} = 5.23$ ,  $SD_{\text{vor}} = 1.00$ ;  $M_{\text{während}} = 5.40$ ,  $SD_{\text{während}} = 0.93$ ). Der Effekt der Zeit kann als gross bezeichnet werden [Pillai-Spur = .16,  $F(1, 122.00) = 23.17$ ,  $p < .0005$ ,  $\eta^2 = .16$ ]. Demgegenüber verfehlt der Interaktionseffekt (Zeit x Beanspruchung) das Signifikanzniveau ( $p > .05$ ). Demzufolge kann festgehalten werden, dass sich die Befindlichkeitsmittelwerte der beiden Beanspruchungsgruppen sowohl zu Beginn als auch während der Sportaktivität signifikant unterscheiden. Konkret werden bei niedrigen Beanspruchungen positivere Befindlichkeitszustände verzeichnet als bei moderater aerober Beanspruchung.

Hinsichtlich der interindividuellen Unterschiede in der aktuellen Befindlichkeit weisen in der niedrigen Beanspruchungsgruppe 42% eine positive und 52% keine Veränderung von vor zu während der Sportaktivität auf. In der moderaten Beanspruchungsgruppe zeigen 30% eine positive Veränderung und 52% bleiben konstant. Zusammenfassend weisen also 94% bzw. 82% eine positive Reaktion auf. Daraus lässt sich schliessen, dass die Befindlichkeitsveränderungen in beiden Gruppen homogen ausfallen.

### Diskussion:

Die Annahmen der Dual Mode Theorie für aerobe Belastungen fanden im Rahmen dieser Felduntersuchung Bestätigung. Zusammenfassend weisen die Teilnehmenden während Seniorensportkursen

eine positive Befindlichkeit und homogene Befindlichkeitsveränderungen (vor-während) bei aeroben Belastungen auf.

Die positiven, homogenen Befindlichkeitsveränderungen sowohl bei niedriger als auch bei moderater Beanspruchung und der nicht vorhandene Interaktionseffekt führen zum Schluss, dass eine weitere Differenzierung der Dual Mode Theorie nicht notwendig ist.

Bezugnehmend zur Verknüpfung von Befindlichkeitsveränderungen und dem Sportverhalten müssten basierend auf diesen Ergebnissen sportliche Aktivitäten mit niedriger Intensität bei Personen im höheren Erwachsenenalter gefördert werden. Dieser Erkenntnisgewinn könnte für zukünftige Bewegungsempfehlungen für ältere Menschen und für die Praxis des Seniorensports relevant sein.

#### Literatur:

- Acevedo, E., Kraemer, R., Haltom, R., & Tryniecki, J. (2003). Percentual responses proximal to the onset of blood lactate accumulation. *Journal of Sports Medicine and Physical Fitness*, 43, 267-273.
- Arent, S., Landers, D., & Etnier, J. (2000). The Effects of Exercise on Mood in Older Adults : A Meta-Analytic Review. *Journal of Ageing and Physical Activity*, 8, 407-430.
- Borg, G. (1998). *Borg's perceived exertion and pain scales*. Champaign: Human Kinetics.
- Borg, G., & Kaijser, L. (2006). A comparison between three rating scales for perceived exertion and two different work tests. *Scandinavian Journal of Medicine and Science in Sports*, 16, 57-69.
- Bundesamt für Sport (2013). *Gesundheitswirksame Bewegung bei älteren Erwachsenen. Empfehlungen für die Schweiz*. Magglingen: BASPO.
- Bundesamt für Statistik (2010). *Gesundheit und Gesundheitsverhalten in der Schweiz 2007. Schweizerische Gesundheitsbefragung*. Neuenburg: BFS.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155-159.
- Ekkekakis, P. (2003). Pleasure and displeasure from the body : Perspectives from exercise. *Cognition and Emotion*, 17, 213-239.
- Ekkekakis, P., Parfitt, G., & Petruzzello, S. (2011). The pleasure and displeasure people feel when they exercise at different intensities. *Sports Medicine*, 41 (8), 641-671.
- King, A., Haskell, W., Taylor, C., Kraemer, H. & DeBusk, R. (1991). Group- vs Home-based exercise training in healthy older men and women. A community-based clinical trial. *JAMA*, 266 (11), 1535-1542.
- Nelson, M. E., Rejeski, W. J., Blair, S. N., Duncan, P. W., Judge, J. O., King, A. C. et al. (2007). Physical activity and public health in older adults : recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation*, 116, 1094-1105.
- Wilhelm, P., & Schoebi, D. (2007). Assessing Mood in Daily Life. Structural Validity, Sensitivity to Change, and Reliability of a Short-Scale to Measure Three Basic Dimensions of Mood. *European Journal of Psychological Assessment*, 23 (4), 258-267.

**Titel:**

BMZI-Senioren: Adaption des Berner Motiv- und Zielinventars im Freizeit- und Gesundheitssport für Menschen im höheren Erwachsenenalter

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**Abstract:**

**Einleitung:**

Über die Hälfte der Schweizerinnen und Schweizer ab 65 Jahren sind mit wöchentlich unter 2.5 Stunden Bewegung zu wenig körperlich aktiv (Lamprecht, Fischer & Stamm, 2008). Angesichts des Potenzials körperlich-sportlicher Aktivitäten für die Gesundheit und Lebensqualität, gewinnt die Förderung regelmässiger Bewegungs- und Sportaktivitäten bei älteren Menschen zunehmend an Bedeutung.

Für eine effiziente Bewegungs- und Sportförderung werden zielgruppenspezifische Massnahmen gefordert (Fuchs, 2003). Interventionen sollen dementsprechend auf die Handlungsvoraussetzungen der Adressaten zugeschnitten sein. Aktuell werden die Massnahmen vor allem auf die körperlich-motorischen Voraussetzungen und den soziodemografischen Hintergrund der Älteren ausgerichtet. Sportbezogene Motive und Ziele werden in der Konzeption der Interventionen selten systematisch miteinbezogen, wenngleich sie für das Wohlbefinden und die Aufrechterhaltung des Gesundheitsverhaltens eine zentrale Rolle spielen (Sudeck & Conzelmann, 2011).

Lehnert, Sudeck und Conzelmann (2011) haben das Berner Motiv- und Zielinventar im Freizeit- und Gesundheitssport (BMZI) entwickelt, welches die folgenden sieben Motiv- und Zielbereiche erfasst: (1) Kontakt, (2) Wettkampf/Leistung, (3) Aktivierung/Freude, (4) Ablenkung/Katharsis, (5) Figur/Aussehen, (6) Gesundheit/Fitness und (7) Ästhetik. Das BMZI wurde für Personen im mittleren Erwachsenenalter konzipiert und getestet. Eine Übertragung der gewonnenen Erkenntnisse auf Menschen im höheren Erwachsenenalter kann nicht vorausgesetzt werden, da sich Ziele über die Lebensspanne verändern (Brunstein, Maier & Dargel, 2007). In diesem Beitrag wird folglich das BMZI für Menschen im höheren Erwachsenenalter adaptiert.

Aus theoretischer Sicht ist das BMZI für Ältere folgendermassen anzupassen: (a) *Generierung von Items zur Differenzierung der Facetten Fitness und Gesundheit.* Der Stellenwert der Gesundheit gewinnt im Verlauf des Erwachsenenalters an Bedeutung (Dittmann-Kohli, 1995), weshalb anzunehmen ist, dass der Beweggrund Fitness/Gesundheit im höheren Erwachsenenalter kognitiv differenzierter repräsentiert ist. (b) *Generierung von Items zur körperlichen Alltagskompetenz sowie (c) zur kognitiven Leistungsfähigkeit.* Das Älterwerden ist durch eine Reduktion der physischen und geistigen Funktionsfähigkeit geprägt. Regelmässiges Sporttreiben stellt ein geeignetes Mittel dar, um diese Altersprozesse positiv zu beeinflussen (Voelcker-Rehage, Godde & Staudinger, 2005). (d) *Generierung von Items zur Rhythmisierung und Strukturierung der Pensionsphase.* Mit dem Ausstieg aus dem Erwerbsleben verändert sich die Lebenssituation von Erwachsenen bedeutsam. Die Anforderung, Zeit sinnvoll auszufüllen ist bei Älteren grösser als bei Erwerbstätigen. Regelmässiges Sporttreiben stellt für Pensionierte eine Möglichkeit dar, ihren Alltag zu strukturieren (Burzan, 2002). (e) *Generierung von Items zum psychischen Wohlbefinden.* Die Erholung von arbeitsbedingten Belastungen ist für Erwerbstätige ein wichtiges Lebensthema, weshalb die Ziele Ablenkung/Katharsis und Aktivierung/Freude im BMZI eine zentrale Rolle einnehmen. Für Menschen im höheren Erwachsenenalter allerdings, ist weniger die Stressreduktion relevant, vielmehr stehen allgemeinere Konzepte wie Wohlergehen oder Zufriedenheit im Zentrum (Westerhof, 2000).

**Methode:**

Die Weiterentwicklung des BMZIs für Menschen im höheren Erwachsenenalter beinhaltete folgende drei Schritte: (1) Erstellung eines 43 Items umfassenden Itempools, welcher die folgenden Facetten abdeckte: Figur/Aussehen, Kontakt, Ästhetik, Wettkampf/Leistung sowie neu Gesundheit, Fitness, Alltagskompetenz, psychisches Wohlbefinden, Kognitive Funktionsfähigkeit und Rhythmisierung und Strukturierung der Pensionsphase; (2) Explorative Hauptkomponentenanalyse (Promax-Rotation) des Itempools in Studie 1 ( $N = 306$ ,  $M = 72.4$  Jahre,  $SD = 5.3$  Jahre, 65% Frauen) und Studie 2a ( $N = 212$ ,



$M = 72.6$  Jahre,  $SD = 6.0$  Jahre, 70% Frauen), wobei die Itemzahl sukzessive reduziert wurde, (3) konfirmatorische Faktorenanalyse (ML-Schätzung) des finalen BMZI-Senioren in Studie 2b sowie Kreuzvalidierung mit Studie 3 ( $N = 253$ ,  $M = 70.8$  Jahre,  $SD = 5.2$  Jahre, 49% Frauen).

Den Probanden wurde folgende Frage gestellt: „Warum treiben Sie Sport/Warum würden Sie Sport treiben?“. Die Items wurden auf einer 5-stufigen Ratingskala (1 = „trifft nicht zu“ bis 5 = „trifft sehr zu“) beantwortet.

**Resultate:**

In Studie 1 wurden mittels explorativer Hauptkomponentenanalyse sieben Faktoren extrahiert ( $KMO = 0.87$ ; 66% Varianzaufklärung). Die Ziele (1) *Figur/Aussehen*, (2) *Kontakt*, (3) *Kognitive Funktionsfähigkeit* und (4) *Wettkampf/Leistung* konnten für das höhere Erwachsenenalter reproduziert werden. Die Items zum psychischen Wohlbefinden schlossen sich nicht zu einem gemeinsamen Faktor zusammen. Vielmehr bildeten die Items zum Abbau negativer Affekte ein eigenständiges Ziel. Nach Auswahl der repräsentativsten Items wurde der Faktor mit (5) *Stimmungsregulation* umschrieben. Die Items zu positiv gefärbten Affekten während der Sportausübung verschmolzen mit den Items zur Ästhetik zu einem Faktor. Dieses Ziel wurde mit (6) *Positive Bewegungserfahrungen* bezeichnet. Die Items aus den Bereichen Gesundheit, Alltagskompetenz und Fitness bildeten zusammen einen Faktor. Weil die Fitness-Items problematisch niedrige Itemschwierigkeiten hatten und folglich eine Differenzierung der Zielgruppe verunmöglichen, wurden sie gestrichen. Der resultierende Faktor wurde mit (7) *Alltagskompetenz/Gesundheit* umschrieben. Die Zielfacetten der Rhythmisierung und Strukturierung der Pensionsphase konnte nicht abgebildet werden, weshalb die betreffenden Items gestrichen wurden. Die Sieben-Faktoren-Struktur ( $KMO = 0.84$ ; 70% Varianzaufklärung) konnte in Studie 2a bestätigt werden.

Bei den konfirmatorischen Faktorenanalysen zeigten sich in Studie 2b [ $p_{\text{Bollen-Stine-Bootstrap}} = .01$ ,  $\chi^2/df = 1.55$ ,  $RMSEA = .05$  (C. I. 95%: .04-.06),  $SRMR = .06$ ,  $CFI = .94$ ] und Studie 3 akzeptable Modell-Fits [ $p_{\text{Bollen-Stine-Bootstrap}} < .01$ ,  $\chi^2/df = 1.96$ ,  $RMSEA = .06$  (C. I. 95%: .05-.07),  $SRMR = .06$ ,  $CFI = .92$ ]. Die Faktorladungen des BMZI-Senioren waren in beiden Studien signifikant und sind als befriedigend bis gut zu bewerten (vgl. Abb. 1).

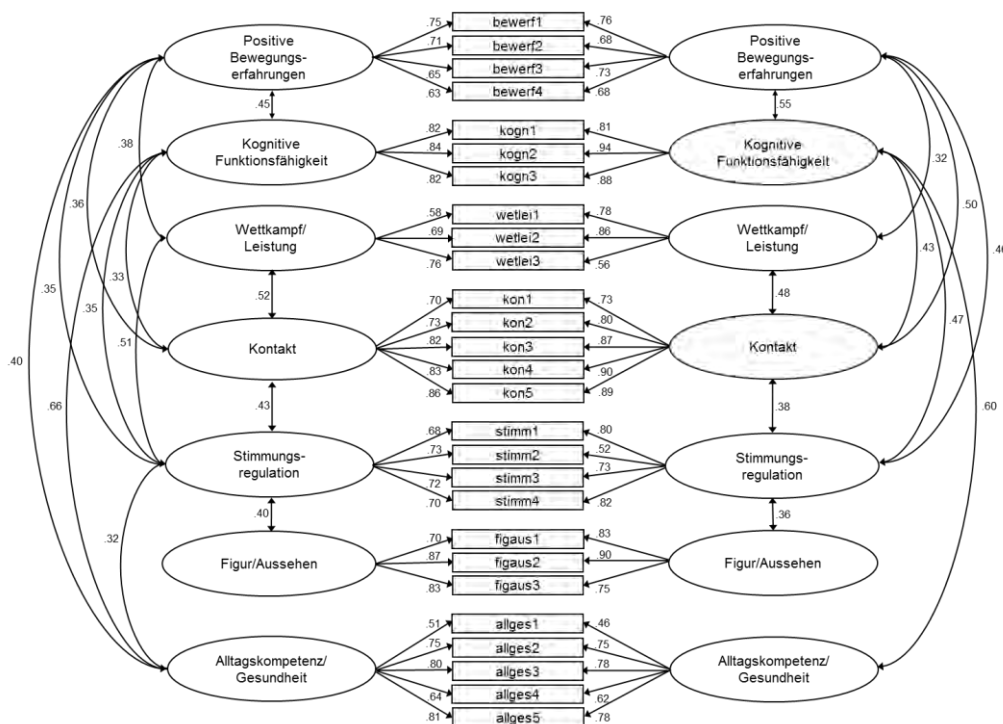


Abbildung 1. Konfirmatorische Faktorenanalyse des BMZI-Senioren (links: Studie 2b, rechts: Studie 3; Kovarianzen zwischen latenten Faktoren sind ab  $r \geq .30$  abgebildet)

Die internen Konsistenzen liegen insgesamt im hohen Bereich (vgl. Tab. 1). Alltagskompetenz/Gesundheit war in beiden Stichproben das wichtigste, Wettkampf/Leistung das unbedeutendste Ziel.

Table 1. Itemformulierung, statistische Kennwerte und Reliabilitätsindizes des BMZI-Senioren

	Kürzel	Itemformulierung	Studien	
			2b	3
Kontakt	kon1	um mit anderen gesellig zusammen zu sein.		
	kon2	um etwas in einer Gruppe zu unternehmen.	$M = 2.92$	$M = 2.29$
	kon3	um dabei Freunde/Bekannte zu treffen.	$SD = 1.01$	$SD = 0.99$
	kon4	um dadurch Menschen kennen zu lernen.	$\alpha = .90$	$\alpha = .93$
	kon5	um durch den Sport neue Freunde zu gewinnen.		
Alltagskompetenz/ Gesundheit	allges1	um mich in körperlich guter Verfassung zu halten.		
	allges2*	um meine Selbstständigkeit im Alltag zu erhalten.	$M = 4.27$	$M = 4.12$
	allges3*	um mich im Alltag sicher fortbewegen zu können.	$SD = 0.70$	$SD = 0.74$
	allges4*	um körperlichen Beschwerden entgegenzuwirken.	$\alpha = .83$	$\alpha = .81$
	allges5*	um im Alltag körperlich mobil zu bleiben.		
Stimmungs- regulation	stimm1	um Stress abzubauen.		
	stimm2*	um etwas gegen meine Energielosigkeit zu tun.	$M = 2.31$	$M = 2.08$
	stimm3*	um mich weniger niedergeschlagen zu fühlen.	$SD = 0.97$	$SD = 0.88$
	stimm4*	um mich weniger angespannt zu fühlen.	$\alpha = .80$	$\alpha = .81$
Kognitive Funktions- fähigkeit	kogn1*	um geistig fit zu bleiben.	$M = 3.79$	$M = 3.21$
	kogn2*	um meine Denkfähigkeit zu erhalten.	$SD = 1.02$	$SD = 1.17$
	kogn3*	um mein Gedächtnis zu trainieren.	$\alpha = .89$	$\alpha = .91$
Positive Bewegungs- erfahrungen	bewerf1	weil es mir Freude bereitet, die Schönheit der menschlichen Bewegung im Sport zu erleben.		
	bewerf2	weil Sport mir die Möglichkeit für schöne Bewegungen bietet.	$M = 3.55$	$M = 3.27$
	bewerf3	vor allem aus Freude an der Bewegung.	$SD = 0.92$	$SD = 0.98$
	bewerf4*	um angenehme körperliche Erfahrungen zu machen.	$\alpha = .78$	$\alpha = .81$
Figur/ Aussehen	figaus1	um abzunehmen.	$M = 2.28$	$M = 2.09$
	figaus2	um mein Gewicht zu regulieren.	$SD = 1.00$	$SD = 0.95$
	figaus3	wegen meiner Figur.	$\alpha = .85$	$\alpha = .87$
Wettkampf/ Leistung	wetlei1	weil ich im Wettkampf aufblühe.	$M = 1.66$	$M = 1.53$
	wetlei2	um mich mit anderen zu messen.	$SD = 0.81$	$SD = 0.68$
	wetlei3	um sportliche Ziele zu erreichen.	$\alpha = .72$	$\alpha = .77$

Anmerkung: \* spezifisch fürs höhere Erwachsenenalter entwickelte Items

#### Diskussion:

Mit dem BMZI-Senioren liegt erstmalig ein Instrument vor, das die Diagnose der psychischen Handlungsvoraussetzungen im Gesundheits- und Freizeitsport bei Menschen im höheren Erwachsenenalter erlaubt. Der Fragebogen bietet eine Grundlage, um Sportprogramme oder -beratungen systematisch auf die Motive und Ziele zuzuschneiden.

In künftigen Arbeiten sind die spezifischen Inhalte und Inszenierungsformen von Sportaktivitäten zu bestimmen, die das Erreichen der individuellen Ziele ermöglichen. Einen Anhaltspunkt hierfür bietet die Arbeit von Sudeck und Conzelmann (2011), in welcher massgeschneiderte Programme für Personen im mittleren Erwachsenenalter durchgeführt und evaluiert wurden.

#### Literatur:

- Brunstein, J. C., Maier, G. W. & Dargel, A. (2007). Persönliche Ziele und Lebenspläne: Subjektives Wohlbefinden und proaktive Entwicklung im Lebenslauf. In J. Brandstädter & U. Lindenberger (Hrsg.), *Entwicklungspsychologie der Lebensspanne. Ein Lehrbuch*. Stuttgart: Kohlhammer.
- Burzan, N. (2002). *Zeitgestaltung im Alltag älterer Menschen: Eine Untersuchung im Zusammenhang mit Biographie und sozialer Ungleichheit*. Opladen: Leske + Budrich.
- Dittmann-Kohli, F. (1995). *Das persönliche Sinnsystem: Ein Vergleich zwischen frühem und spätem Erwachsenenalter*. Göttingen: Hogrefe.
- Fuchs, R. (2003). *Sport, Gesundheit und Public Health*. Göttingen: Hogrefe.
- Lamprecht, M., Fischer, A. & Stamm, H. P. (2008). *Sport Schweiz 2008: Das Sportverhalten der Schweizer Bevölkerung*. Magglingen: BASPO.
- Lehnert, K., Sudeck, G. & Conzelmann, A. (2011). BMZI – Berner Motiv- und Zielinventar im Freizeit- und Gesundheitssport. *Diagnostica*, 57, 146-159.
- Sudeck, G. & Conzelmann, A. (2011). Motivbasierte Passung von Sportprogrammen. Explizite Motive und Ziele als Moderatoren von Befindlichkeitsveränderung durch sportliche Aktivität. *Sportwissenschaft*, 41, 175-189.
- Voelcker-Rehage, C. Godde, B. & Staudinger, U. M. (2005). Bewegung, körperliche und geistige Mobilität im Alter. *Bundesgesundheitsblatt, Gesundheitsforschung und Gesundheitsschutz*, 49, 558-566.
- Westerhof, G. J. (2000). Lebensevaluierung: Bewertungsdimensionen und Vergleichsprozesse. In F. E. Dittmann-Kohli, C. Böde & G. Westerhof (Hrsg.), *Die zweite Lebenshälfte. Psychologische Perspektiven: Ergebnisse des Alters-Survey* (S. 129–168). Stuttgart: Kohlhammer.

**Abstractvorlage für den Nachwuchspreis; 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg**

**Title:**

Motivtypen als Instrument zur Vorhersage von sportlichem Erfolg im Nachwuchsleistungsfussball

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**Abstract:**

**Introduction:**

Es ist mittlerweile unbestritten, dass psychologische Merkmale wie Motivation für sportlichen Erfolg von wesentlicher Bedeutung sind, weshalb sie in den heute üblichen multidimensionalen Talentmodellen Eingang finden (Morris, 2000). Innerhalb der Motivation werden zurzeit verschiedene Konstrukte intensiv diskutiert, denen für die Talentselektion und Talententwicklung Bedeutung zugeschrieben wird. Um dieser Multidimensionalität der Motivation gerecht zu werden, bietet sich ein ganzheitlicher Zugang an, indem Motivprofile – bestehend aus mehreren Konstrukten – herangezogen werden. Der Vorteil solcher Profile besteht darin, dass den Wechselwirkungen und Kompensationsmöglichkeiten zwischen einzelnen Konstrukten, die für die Talententwicklung charakteristisch sind (Abbott et al., 2005), Rechnung getragen werden kann. Für die Talentselektion ist es zudem wichtig zu wissen, wie diese Muster mit sportlichem Erfolg einhergehen.

Ein Ansatz, der diesen Charakteristiken von Wechselwirkungen und Kompensation Rechnung trägt, ist der personorientierte Zugang. Der personorientierte Ansatz sieht ein Individuum als funktionierendes Ganzes, dessen individuelle Entwicklung sich durch vielfältige Wechselwirkungen in der aktiven Auseinandersetzung zwischen dem Individuum und seiner Umwelt vollzieht. Das Individuum und seine Umwelt werden dabei als ein System verstanden. Diese Ganzheitlichkeit ist methodisch jedoch nicht umsetzbar, weshalb das Person-Umwelt-System in verschiedene Subsysteme aufgegliedert werden kann, die wiederum wechselseitig zusammenwirken. Entwicklung wird dabei als Abfolge von sich ändernden Systemzuständen, sogenannten Mustern, beschrieben. Die Muster werden durch Konfigurationen der am System beteiligten Variablen gebildet (Bergman et al., 2003).

Die vorliegende Studie folgt diesem Zugang, indem der Einfluss des Subsystems Motivation auf die Leistungsentwicklung personorientiert untersucht wird. Das Subsystem Motivation wird dabei in Anlehnung an Conroy und Kollegen (2007) aus den motivationalen Konstrukten Leistungsmotivation, Leistungszielorientierung und Selbstbestimmung gebildet. Zusätzlich wird die Stabilität dieser Muster untersucht, da dies für die Talentprognose von zentraler Bedeutung ist (Régnier et al., 1993).

Hinsichtlich der Stabilität sind zwei Arten zu unterscheiden. Bleiben die Muster auf Gruppenebene stabil (strukturelle Stabilität), können zu verschiedenen Zeitpunkten dieselben Muster identifiziert werden. Sind auf individueller Ebene bestimmte Entwicklungsverläufe überzufällig häufig (individuelle Stabilität) so spricht man von Entwicklungstypen (Bergman et al., 2003). Demzufolge ist folgende Fragestellung für die vorliegende Analyse begleitend: Welche Muster können bei Nachwuchsspitzenfussballern bezüglich des Subsystems Motivation identifiziert werden, wie stabil sind sie und wie gehen sie mit sportlichem Erfolg einher?

**Methods:**

Die oben aufgeworfene Fragestellung wird im Rahmen des vom Schweizerischen Fussballverbandes (SFV) geförderten vierjährigen Forschungsprojekts „Talentselektion und Talentförderung im Schweizer Fussball“ überprüft. Eine Stichprobe aus 97 männlichen Nachwuchsspitzenfussballern ( $M_{\text{Alter}} = 12.24$ ,  $SD = 0.29$ ) wurde dazu im Abstand von einem Jahr zweimal zu ihrer Selbstbestimmtheit (Pelletier et al., 1995;  $\alpha_{t1/t2} = .82/.86$ ), ihren Leistungsmotivfacetten Hoffnung auf Erfolg (HE) und Furcht vor Misserfolg (FM) (Elbe et al., 2005;  $\alpha_{HEt1/t2} = .69/.76$ ,  $\alpha_{FMt1/t2} = .79/.73$ ) und ihren Leistungszielorientierungen Sieg- und Zielorientierung (Elbe, 2004;  $\alpha_{SOt1/t2} = .74/.72$ ,  $\alpha_{ZOt1/t2} = .66/.81$ ) befragt. Wiederum ein Jahr später wurde erhoben, welche Spieler in die U-15 Nationalmannschaft aufgeboten wurden. Die Auswertung wird mit der LICUR-Methode (Linking of Clusters after removal of a Residue) vorgenommen (Bergman et al. 2003). Diese stellt ein musteranalytisches Verfahren dar, das sich für die Umsetzung personorientierter Ansätze eignet. Der Ablauf der LICUR-Methode umfasst drei Schritte. Zuerst wird eine Residualanalyse vollzogen, in der

Ausreisser identifiziert und entfernt werden. In dieser Untersuchung wurden pro Messzeitpunkt (MZP) zwei Ausreisser entfernt. Im zweiten Schritt werden zu beiden MZP phasenspezifische Cluster (=Muster) gebildet (Clusteranalyse; Ward, quadrierte euklidische Distanz). Zu beiden MZP hat sich eine 4-Clusterlösung als optimal herausgestellt. Diese weist zu  $t_1$  eine erklärte Fehlerquadratsumme von 47.8%, zu  $t_2$  von 53.6% auf. Im letzten Schritt werden einerseits die Ähnlichkeiten zwischen den Mustern der beiden Phasen (strukturelle Stabilität) sowie deren Übertrittswahrscheinlichkeiten zueinander (individuelle Stabilität) und andererseits die Übertrittswahrscheinlichkeiten zum Leistungskriterium analysiert. Durch den Vergleich der Anzahl zu erwartender und tatsächlicher Übertritte lassen sich überzufällig häufige (sog. Entwicklungstypen) und seltene (sog. Entwicklungsantitypen) Pfade identifizieren ( $p_{\text{einseitig}} < .05$ ). Der erste und dritte Schritt wurde mit SLEIPNER 2.1 (Bergman & El-Khoury, 2002), die Clusteranalyse mit IBM SPSS Statistics 21 durchgeführt.

**Results:**

Wie in Abbildung 1 ersichtlich, lassen sich zu beiden MZP vier Muster identifizieren. Die Cluster zu  $t_1$  können zu  $t_2$  in ähnlicher Form repliziert werden, was für eine hohe strukturelle Stabilität spricht. Die Distanzwerte (durchschnittlicher quadrierter euklidischer Abstand zwischen den Clustern) liegen lediglich zwischen  $0.05 \leq SS \leq 0.42$ . Es wurden daher für beide MZP die gleichen Labels verwendet. Die Cluster sind zu beiden MZP durchwegs relativ homogen, was sich in den tiefen Werten der Homogenitätskoeffizienten (HC) zeigt.

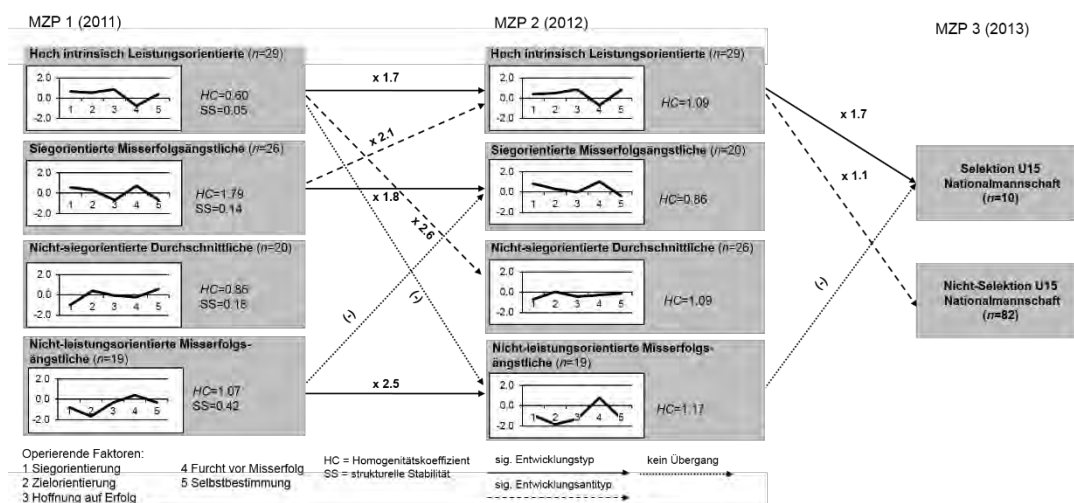
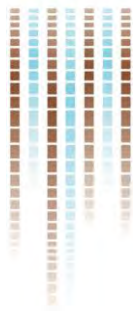


Abbildung 1. z-standardisierte Clusterprofile und Entwicklungs(anti)typen zwischen  $t_1$  und  $t_2$  sowie zum Leistungskriterium.

In Abbildung 1 sind auch die Entwicklungs(anti)typen von  $t_1$  zu  $t_2$  und zum Leistungskriterium dargestellt. Es zeigt sich, dass die drei beobachtbaren Entwicklungstypen zwischen  $t_1$  zu  $t_2$  zwischen strukturell stabilen Clustern verlaufen. Bei den Gruppen der *hoch intrinsisch Leistungsorientierten*, den *siegorientierten Misserfolgsängstlichen* und *nicht leistungsorientierten Misserfolgsängstlichen* besteht somit eine überzufällige Wahrscheinlichkeit, dass sie ein Jahr später wieder zu dieser Gruppe gehören. Mit Blick auf die Talentselektion sind vor allem die Entwicklungsverläufe zum Leistungskriterium interessant. Erwartungsgemäss weisen die *hoch intrinsisch Leistungsorientierten*, die überdurchschnittlich hohe Werte in allen positiv assoziierten Variablen aufweisen, eine signifikant erhöhte Übertrittswahrscheinlichkeit (Odds Ratio = 1.7) in die U-15 Nationalmannschaft auf, während von den *nicht leistungsorientierten Misserfolgsängstlichen*, die sich durch unterdurchschnittliche Werte in den als positiv assoziierten Merkmalen charakterisieren, kein Spieler selektioniert wird. Die *siegorientierten Misserfolgsängstlichen* sowie die *durchschnittlich Motivierten* weisen keine überzufällig häufigen oder seltenen Übertrittswahrscheinlichkeiten in die beiden Leistungsgruppen auf. Dennoch wurden einzelne Spieler mit diesen Motivprofilen in die U-15 Nationalmannschaft selektioniert. Dies spricht dafür, dass einzelne motivationale Schwächen kompensiert werden können. Falls jedoch alle Merkmale des Subsystems Motivation ungünstig ausgeprägt sind, scheint



dies wie im Falle der nicht *leistungsorientierten Misserfolgsängstlichen* ein leistungshinderlicher Systemzustand darzustellen.

Zusammenfassend lässt sich sagen, dass das Muster der hoch intrinsisch Leistungsorientierten strukturell wie auch individuell stabil ist und zudem in besonderem Masse mit sportlichem Erfolg im Fussball einhergeht.

#### **Discussion/Conclusion:**

In der vorliegenden Untersuchung wurde erstmals durch eine personorientierte Vorgehensweise das Subsystem Motivation von talentierten Nachwuchsfussballern abgebildet und dessen Zusammenhänge zu sportlichem Erfolg untersucht. Dabei wurden vier – über einen Zeitraum von einem Jahr – strukturell stabile Muster identifiziert. Insgesamt konnten zumeist erwartungskonforme Entwicklungstypen bestimmt werden. Das Muster mit hohen Ausprägungen in Sieg- und Zielorientierung, HE und Selbstdetermination führt überzufällig häufig zu einer Nomination in die U-15 Nationalmannschaft und ist damit mit höherer sportlicher Leistung assoziiert. Die Möglichkeit der Ableitung von Kompensationsmechanismen zeigt den Mehrwert des angewandten personorientierten Ansatzes, da diese in variablenorientierten Analysen nicht hätten gefunden werden können. Ausgehend vom Befund der hohen individuellen Stabilität zwischen strukturell stabilen Mustern kann mit Blick auf die Talentselektion geschlossen werden, dass der Zeitpunkt der Typisierung nicht von grosser Bedeutung ist und dass das motivationale System in diesem Zeitraum relativ stabil ist, was auf eine gewisse Selektionsrelevanz hinweist.

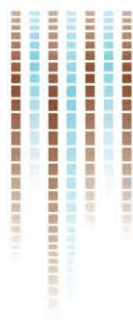
In weiterführenden längsschnittlichen Studien ist zu prüfen, inwiefern die identifizierten Cluster sich ebenfalls in anderen Sportarten und in anderen Entwicklungsphasen zeigen und ob sie allenfalls auch längerfristig mit sportlichem Erfolg einhergehen. Die Nomination in die U-15 Nationalmannschaft ist zwar ein hoch relevantes Kriterium im Spitzenfussball in der Schweiz (Conzelmann & Zibung, 2009), vermag aber den Erfolg im Höchstleistungsalter nicht deterministisch vorherzusagen. Trotz dieser Einschränkungen weisen die Ergebnisse dieser Untersuchung darauf hin, dass eine leistungsorientierte motivationale Ausrichtung einen bedeutsamen Einfluss auf die Selektionsentscheidung von Nationaltrainern hat und deshalb durchaus ein wichtiges Talentkriterium darstellt.

#### **References:**

- Abbott, A., Button, C., Pepping, G.-J., & Collins, D. (2005). Unnatural selection: talent identification and development in sport. *Nonlinear dynamics, psychology, and life sciences*, 9(1), 61–88.
- Bergman, L. R., & El-Khoury, B. M. (2002). *SLEIPNER - a statistical package for pattern-oriented analyses: User Manual*. Stockholm University.
- Bergman, L.R., Magnusson, D. & El-Khoury, B.M. (2003). *Studying individual development in an interindividual context. A person-oriented approach*. Mahwah, N.J: Erlbaum.
- Conroy, D. E., Elliot, A. J., & Coatsworth, J. D. (2007). Competence motivation in sport and exercise: The hierarchical model of achievement motivation and self-determination theory. In M. Hagger & N. Chatzis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 181–192). Champaign: Human Kinetics.
- Conzelmann, A. & Zibung, M. (2009). *Sportliche Karrieren Schweizer Spitzenfussballer. Projektbericht*. Bern: Institut für Sportwissenschaft der Universität Bern und Schweizerischer Fussballverband (SFV).
- Elbe, A.-M. (2004). Testgütekriterien der deutschen Version des Sport Orientation Questionnaires. *Spectrum der Sportwissenschaft*, 16(1), 96–107.
- Elbe, A.-M., Wenhold, F., & Müller, D. (2005). Zur Reliabilität und Validität der Achievement Motives Scale-Sport. *Zeitschrift für Sportpsychologie*, 12(2), 57–68.
- Morris, T. (2000). Psychological characteristics and talent identification in soccer. *Journal of Sports Sciences*, 18(9), 715–726.
- Pelletier, L. G., Tuson, K. M., Fortier, M. S., Vallerand, R. J., Briere, N. M., & Blais, M. R. (1995). Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: The Sport Motivation Scale (SMS). *Journal of Sport & Exercise Psychology*, 17(1), 35–53.
- Régnier, G., Salmela, J., & Russell, S. J. (1993). Talent detection and development in sport. In R. N. Singer, M. Murphey, & L. K. Tennant (Eds.), *Handbook of research on sport psychology* (2nd ed., pp. 290–313). New York: Macmillan Publishing Company.

**Fachbereich**

**Posterpräsentation  
Naturwissenschaften**



## Comparison of Three Gold-Standards to Measure Ground Contact Time in Runners

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### Introduction:

Time, heart rate, distance covered and speed are the most often monitored parameters to quantify an athlete's running training today (Fleming, Young, Dixon, & Carré, 2010). However, an even more fundamental and systematic monitoring of training might be of further benefit for the training regulation. For example, ground contact time (GCT) is a paramount parameter in running. Several authors have demonstrated, that the shorter the GCT, the faster the runner (Bushnell & Hunter, 2007; Hasegawa, Yamauchi, & Kraemer, 2007; Weyand, Sternlight, Bellizzi, & Wright, 2000). Even at an equal speed, a more successful athlete has a shorter GCT than a less successful athlete. Hasegawa et al. (2007) showed a significant correlation between the GCT and the final result in a half marathon race. Shorter GCT was associated with a better end ranking. Hence, a reduction in GCT of only milliseconds, while maintaining the same ground reaction force, can lead to significant improvements in performance. In the literature, GCT is mainly assessed in laboratory settings by means of force plates (FP), optical timing systems or optical motion capture systems (Bushnell & Hunter, 2007; Debaere, Jonkers, & Delecluse, 2013; Girard, Millet, Slawinski, Racinais, & Micallef, 2013). Yet, it is not clear to what extent these three methods agree on GCT measures. For athletes, coaches and researchers it is of great importance to know what method can be best applied to assess GCT. Thus, the purpose of the present study was to compare three gold-standards, most cited in the literature, to determine GCT in runners.

### Methods:

One well trained male athlete (25.8 years of age, 182 cm, 67 kg), familiarized with the procedure used in this study, volunteered for this research. The participant ran several times a distance of 30 m at different self-selected velocities (4.71 – 6.71 m/s) on an indoor track. After 25 m, a .90 x .90 m FP (Quattro Jump, Kistler, Winterthur, Switzerland), with 500 Hz sampling rate, was placed. Contact time on the FP was defined in two ways, according to varying indications in the literature (Castagna et al., 2013; Girard, et al., 2013; Greene et al., 2010): firstly, as the time at which the force level was  $\geq 5$  N, secondly,  $\geq 10$  N (subsequently labeled as FP5N and FP10N, respectively). Two Optojump (OJ; Optojump Next, Microgate, Bolzano, Italy) bars, sampling at 1000 Hz, were located on top of the FP, one bar on each side of the FP's edge. The OJ bars communicate continuously by optical light-emitting diodes (LEDs), whereby one bar sends and the other receives the LED signals. For instance, when a foot is placed between these bars, the LED communication is interrupted and this time window is defined as GCT of one step. Further, at surface level with the FP and OJ, a high speed video camera (VC; Red Epic Mysterium-X, Red Digital Cinema Camera Company, Lake Forest, California), with 350 Hz sampling rate and full HD (1920 x 1080), was installed. To ensure best possible lighting for the VC, additional headlights spotlighted the abovementioned setup. The evaluation of the GCT of every videotaped step was executed by visual inspection by two independent experts. For this purpose the software Adobe Premiere Pro CC (Adobe Systems Incorporated, San Jose, California) was used. The two experts stated no difficulties in defining initial foot contact and toe off, additionally, they both got the same results on GCT of every step. This setup allowed to capture one single step each trial by all three instruments at the same time. After testing for normal distribution, GCT data of eight valid steps were presented in Bland-Altman plots. To examine differences between the instruments, analysis of variance (ANOVA) with Tukey HSD post-hoc, correlation coefficients and root mean square errors (RMSE) were conducted. Data derived from the VC was regarded as the true value.

### Results:

The VC, OJ, FP5N and FP10N recorded an average GCT of 164 ( $\pm 0.02$ ) ms, 162 ( $\pm 0.02$ ) ms, 160 ( $\pm 0.02$ ) ms and 158 ( $\pm 0.02$ ) ms, respectively. Compared to GCT recorded by VC, the use of OJ, FP5N and FP10N, respectively, underestimated GCT by 1.16 %, 2.67 % and 3.91 %. However, these differences were not significant ( $p = .998$ ,  $p = .971$  and  $p = .919$ ). Correlations between data recorded by each of the instruments; OJ, FP5N, FP10N and the VC measures of GCT were  $r = .998$ ,  $r = .994$ ,  $r = .994$  and RMSE were 2.26 ms, 4.81 ms, 6.68 ms, respectively (Figure 1).



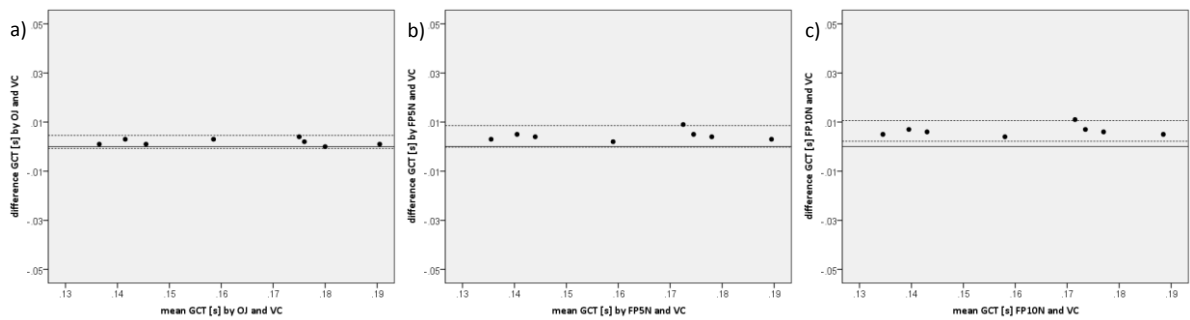


Figure 1. Bland-Altman plots of GCT measured by high speed video camera (VC) and a) Optojump (OJ), b) force plate  $\geq 5$  N threshold (FP5N), c) force plate  $\geq 10$  N threshold (FP10N). The dotted lines represent the mean and  $\pm 1.96$  SD of the difference between the VC and the values of the other instruments; the solid lines represent the origin.

### Discussion / Conclusion:

All instruments assessed GCT within 4 % variation among each other. Hence, comparability among studies using one of these three gold-standards to measure GCT seems to be good. In the present study, OJ showed best accuracy concerning GCT when compared to the high speed VC regarded as the true value. The results revealed, that the 5 N threshold to define ground contact using a FP was closer to the data recorded by VC than the use of a 10 N threshold. The FP can assess only one step each trial. This extends to the VC, which as well can only capture one step at a time and furthermore entails high costs in filming and evaluating. Whereas, the OJ can record continuous steps over several meters, due to the single 1 m bars, which can arbitrarily be linked together. In conclusion, the present study showed, that all three gold-standards (VC, OJ and FP) seem to be precise in the detection of GCT. However, OJ claimed best feasibility among the three systems. Therefore, the application of the OJ system is recommended to collect accurate data of athlete's GCT during training sessions and as gold-standard to validate new measurement devices.

### References:

- Bushnell, T., & Hunter, I. (2007). Differences in technique between sprinters and distance runners at equal and maximal speeds. *Sports Biomech*, 6(3), 261-268.
- Castagna, C., Ganzetti, M., Ditroilo, M., Giovannelli, M., Rocchetti, A., & Manzi, V. (2013). Concurrent validity of vertical jump performance assessment systems. *J Strength Cond Res*, 27(3), 761-768.
- Debaere, S., Jonkers, I., & Delecluse, C. (2013). The contribution of step characteristics to sprint running performance in high-level male and female athletes. *J Strength Cond Res*, 27(1), 116-124.
- Fleming, P., Young, C., Dixon, S., & Carré, M. (2010). Athlete and coach perceptions of technology needs for evaluating running performance. *Sports Eng*, 13(1), 1-18.
- Girard, O., Millet, G. P., Slawinski, J., Racinais, S., & Micallef, J. P. (2013). Changes in running mechanics and spring-mass behaviour during a 5-km time trial. *Int J Sports Med*, 34(9), 832-840.
- Greene, B. R., McGrath, D., O'Neill, R., O'Donovan, K. J., Burns, A., & Caulfield, B. (2010). An adaptive gyroscope-based algorithm for temporal gait analysis. *Med Biol Eng Comput*, 48(12), 1251-1260.
- Hasegawa, H., Yamauchi, T., & Kraemer, W. J. (2007). Foot strike patterns of runners at the 15-km point during an elite-level half marathon. *J Strength Cond Res*, 21(3), 888-893.
- Weyand, P. G., Sternlight, D. B., Bellizzi, M. J., & Wright, S. (2000). Faster top running speeds are achieved with greater ground forces not more rapid leg movements. *J Appl Physiol*, 89(5), 1991-1999.

Abstractvorlage für den Nachwuchspreis; 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

**Title:**

Kinematics and loading conditions between the left and right wrist during the forward, forward ulnar deviated and backward handspring

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**Abstract:**

**Introduction:**

The forward handspring, the forward handspring with ulnar deviated hand position and the backward handspring are common elements in gymnastics and artistic gymnastics. The wrist joint plays a prominent role in the force transmission and is exposed to great loads while performing these elements. Excessive and repetitively compressive forces acting on the wrist joint can lead to acute and chronic injuries of the wrist (DiFiori, Puffer, Mandelbaum, & Mar, 1996). An earlier study demonstrated that wrist pain is a common problem among none-elite young gymnasts. Wrist pain was prevalent in 73 % of the tested gymnasts who attended this study (De Smet, Claessens, & Fabry, 1993; Dobyns & Gabel, 1990). An asymmetry between the right and left wrist can be assumed to lead to long-term damages in the wrist that is more loaded. Furthermore differences between the left and right wrist such as different joint forces, moments and angles can result in an asymmetrical execution of the three handspring variations, which leads to a compensation in other body segments or to discounts of the gymnasts' performance in a competition. The purpose of the present investigation is to detect differences of the kinematics and the load condition between the left and right wrist during the forward, forward ulnar deviated and backward handspring.

**Methods:**

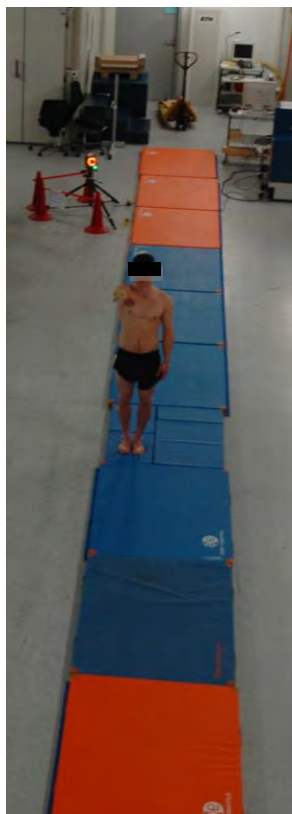


Figure 1: Illustration of the test set up

Seven female and seven male gymnasts performed five forward, forward with ulnar deviated hands and backward handsprings. The backward handspring was generated after a round off. The subjects could participate if they did not have any problems or medical condition with their musculoskeletal system. They were excluded if they had had surgeries or other medical interventions at the wrist. They had to be of age as well. To perform the handsprings floor mats were laid out so that there was enough space for the run in and the landing (see Figure 1). Since the wrist joint was exposed to high loadings, the two force plates which acquired the kinetic data were covered by seven-centimeter thick floor mats. Therefore the test arrangement was in accordance with the conditions the subjects normally exercise in (see Figure 1). The kinematics was tracked with skin markers and a motion analysis system. This system consists of 12 infrared cameras. A floating, a forearm fixed and a hand fixed axis was used, allowing a clinical interpretation of the results for the wrist joint angles. This convention of the joint coordinate system was introduced by Grood and Suntay (1983) on the knee joint and adapted for several other joints as well as the wrist by Wu et al. (2005). In all of the dynamic motion tasks the period where the force acted on the hands and therefore on the wrist joints was defined as the support phase. The kinetic data was normalized over the subject's body weight. The wrist joint force was calculated by means of an inverse approach with a quasi-static solution (Lorenzetti et al., 2012) and then split in three forces acting in three orthogonal directions defined by the forearm segment coordinate system. The forces were named  $F_{if}$ ,  $F_{jf}$  and  $F_{kf}$  and acted along the  $i_f$ -axis,  $j_f$ -axis and  $k_f$ -axis. The sum of the absolute value of these three forces was considered the absolute force  $F_{abs}$ . The same was done for the wrist moments. Therefore the moments were

named  $M_{if}$ ,  $M_{jf}$  and  $M_{kf}$  and acted along the  $i_f$ -axis,  $j_f$ -axis and  $k_f$ -axis. The sum of the absolute value of the three moments was considered the absolute moment  $M_{abs}$ . The mean and standard deviation of the kinematic and kinetic data of the five repetitions were calculated for each subject. This procedure was done for the forward handspring, the forward handspring with ulnar deviated hand position and the backward handspring. The mean and standard deviation of the 14 established means were computed for the three motion variations and the joint angles, forces and moments and compared between the right and the left wrist for each execution form.

The 0.05 level was used to indicate statistical significance. All parameters were tested by the Kolmogorov-Smirnov and the Shapiro-Wilk test to test if the data was normally distributed. In that case the T-test was conducted to find significant differences between the left and right wrist. For not normally distributed parameters the Friedman-test which is a non-parametric test was conducted for the specific parameters. If the Friedman-test showed significant differences the Wilcoxon-test was chosen to find which parameters significantly differed between the left and right side during the three executions. All  $p$ -values were corrected by the Bonferroni adjustment.

#### Results:

There was no difference found in this study between the right and the left wrist for the kinematic parameters, which concerned three clinically defined wrist angles during all execution forms. The kinetic parameters, which included the forces and moments acting along the three coordinate axis of the forearm segment system and the absolute wrist force and moment didn't show any left-right asymmetries either.

#### Discussion/Conclusion:

For the first time research on the load condition of the wrist during the forward, forward with ulnar deviated hand positioning and backward handspring was conducted, considering the force and moment acting on the wrist as well as the wrist angles. Former studies investigated the ground reaction forces acting on both hands and found no significant differences between the left and right hand (DeGoede & Ashton-Miller, 2002; Koh, Grabiner, & Weiker, 1992). In this study no significant differences concerning the wrist forces and angles were found. The symmetric performance shows that the attending subjects were experienced enough to perform technically good handsprings. Worse gymnasts or gymnasts in the process of learning these tasks could show more asymmetries. It is important for coaches and athletes to eliminate left and right asymmetries in the wrist to prevent long-term damages or overcompensating muscles from injuries.

#### References:

- De Smet, L., Claessens, A., & Fabry, G. (1993). Gymnast wrist. *Acta Orthop Belg*, 59(4), 377-380.
- DeGoede, K. M., & Ashton-Miller, J. A. (2002). Fall arrest strategy affects peak hand impact force in a forward fall. *J Biomech*, 35(6), 843-848.
- DiFiori, J. P., Puffer, J. C., Mandelbaum, B. R., & Mar, S. (1996). Factors associated with wrist pain in the young gymnast. *Am J Sports Med*, 24(1), 9-14.
- Dobyns, J. H., & Gabel, G. T. (1990). Gymnast's wrist. *Hand Clin*, 6(3), 493-505.
- Grood, E. S., & Suntay, W. J. (1983). A joint coordinate system for the clinical description of three-dimensional motions: application to the knee. *J Biomech Eng*, 105(2), 136-144.
- Koh, T. J., Grabiner, M. D., & Weiker, G. G. (1992). Technique and ground reaction forces in the back handspring. *Am J Sports Med*, 20(1), 61-66.
- Lorenzetti, S., Gulay, T., Stoop, M., List, R., Gerber, H., Schellenberg, F., & Stussi, E. (2012). Comparison of the Angles and Corresponding Moments in the Knee and Hip during Restricted and Unrestricted Squats. *J Strength Cond Res*. doi: 10.1519/JSC.0b013e318267918b
- Wu, G., van der Helm, F. C., Veeger, H. E., Makhsous, M., Van Roy, P., Anglin, C., . . . Buchholz, B. (2005). ISB recommendation on definitions of joint coordinate systems of various joints for the reporting of human joint motion--Part II: shoulder, elbow, wrist and hand. *J Biomech*, 38(5), 981-992.

Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

**Title:**

Effects of Kinesiotape on quadriceps and hamstring muscle strength

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**Abstract:**

**Background:** Kinesiotaping (KT) is an elastic therapeutic tape developed in the 70's by Dr Kenso Kase for prevention and treatment of sports injuries. Research shows that through activation of skin receptors KT improves blood and lymph flow, increases proprioception, helps relieve pain, facilitates joint and muscle alignment, and enhances muscle function. Despite the increasing popularity of KT, uncertainty remains regarding, in particular, its effectiveness in improving strength.

**Purpose:** The purpose of the current study was to investigate the short-term effects of KT on muscle strength when applied to the quadriceps muscles of healthy subjects.

**Methods:** A randomized controlled trial with 52 healthy subjects was conducted. Subjects were tested under four different conditions: a) facilitating Kinesiotape, b) inhibiting Kinesiotape, c) classical tape with no elastic properties, and d) no-taping across four different sessions. The parameters of interest were: quadriceps and hamstrings maximal strength and power using vertical jump tests (squat jump and countermovement jump), and peak concentric and eccentric knee torque (using isokinetic test protocol).

**Results:** Quadriceps and hamstring maximal strength was not significantly affected by the application of facilitating, inhibitory, or classical tapes, compared with the non-taping condition. Vertical height and peak concentric and eccentric knee torques at different speeds did not reveal positive or negative changes after KT application. **Conclusion:** The KT does not influence quadriceps and hamstring muscles strength in healthy subjects compared to classical tape and no tape. Utilization of KT for immediate performance improvement in healthy subjects is not recommended

**References:**

Kase, K., Wallis, J., & Kase, T. (2003). *Clinical Therapeutic Applications of the Kinesio Taping Method* (2nd ed.). Tokyo, Japan: Ken Ikai Co.

Lins, C. A., Neto, F. L., Amorim, A. B., Macedo Lde, B., & Brasileiro, J. S.

(2013). Kinesio Taping((R)) does not alter neuromuscular performance of femoral quadriceps or lower limb function in healthy subjects: randomized, blind, controlled, clinical trial. *Manual therapy*, 18(1), 41- 45. doi: 10.1016/j.math.2012.06.009

Thelen, M. D., Dauber, J. A., & Stoneman, P. D. (2008). The clinical efficacy of kinesio tape for shoulder pain: a randomized, double-blinded, clinical trial. *The Journal of Orthopaedic and Sports Physical Therapy*, 38(7), 389-395. doi: 10.2519/jospt.2008.2791

Vercelli, S., Sartorio, F., Foti, C., Colletto, L., Virton, D., Ronconi, G., & Ferriero, G. (2012). Immediate effects of kinesiotaping on quadriceps muscle strength: a single-blind, placebo-controlled crossover trial. *Clinical Journal of Sport Medicine*, 22(4), 319-326. doi: 10.1097/JSM.0b013e31824c835d

Williams, S, Whatman, C, Hume, P. A, & Sheerin, K. (2012). Kinesio taping in treatment and prevention of sports injuries: a meta-analysis of the evidence for its effectiveness. *Sports Medicine*, 42(2), 153-164. doi: 10.2165/11594960-000000000-00000

**Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg**

**Title:**

The effect of motor imagery, action observation and neck muscle vibration on cervical joint position sense and pressure pain threshold in chronic neck pain patients

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**Abstract:**

**Introduction:**

Impaired cervical joint position sense is a feature of chronic neck pain (Armstrong, McNair, & Taylor, 2008). Whether impaired joint position sense displays a proprioceptive deficit (Jull, Falla, Treleaven, Hodges, & Vicenzino, 2007) or a more central information processing bias (Beinert & Taube, 2013; Goble, 2010) is under debate. Therefore, we compared 3 different treatments with respect to their effect on joint position sense and pressure pain threshold: First, neck muscle vibration that was previously been shown to improve sensorimotor function of the cervical spine as well as postural control in neck pain patients (Beinert et al. 2013). This intervention is thought to stimulate afferent signal processing (Roll & Vedel, 1982). Second, two further interventions were chosen that are unlikely to influence afferent processing at all but act specifically at the motor side: motor imagery and action observation.

**Methods:**

We conducted a double blinded, three armed, randomized controlled trial with 45 chronic neck pain patients. Cervical joint position sense was assessed for the neutral head position and pressure pain threshold was evaluated at the zygapophyseal joint of C2 and the trigger point of the levator scapulae. All parameters were measured before and directly after the intervention. Targeted neck muscle vibration was applied at the painful region about C2 side with 100 Hz. The motor imagery group imagined cervical joint reposition exercises by following instructions from a voice recorded tape. The action observation group watched a video with a person performing joint reposition exercises. Each group received a treatment of 5 \* 45 seconds of action (vibration or motor imagery or movement observation) with 15 seconds break in-between.

**Results:**

Before intervention, there was no difference between groups regarding sex, age, pain intensity, cervical joint position sense and pressure pain thresholds. Joint position sense improved immediately after the intervention, displaying a time interaction (time pre/post,  $F_{1,42} = 16.287$ ;  $p < 0.001$ .) Further, a time \* group (motor imagery/action observation/ vibration ) interaction was observed ( $F_{2,42} = 3.546$ ;  $p = 0.038$ ). Post hoc analysis revealed no difference between motor imagery and action observation ( $p = 0.762$ ), but motor imagery as well as action observation were superior to neck muscle vibration ( $p = 0.001$ ). Pressure pain threshold displayed a time effect for neck muscle vibration ( $F_{1,14} = 7.792$ ;  $p = 0.014$ ) but not for motor imagery ( $F_{1,14} = 0.00$ ;  $p = 0.984$ ) and action observation ( $F_{1,14} = 0.298$ ;  $p = 0.594$ ).

**Discussion/Conclusion:**

Motor imagery and action observation are interventions that are unlikely to alter afferent information processing. Nevertheless, both interventions improved cervical joint position sense after a single treatment session. Therefore, these results question the assumption that impaired joint position sense is solely due to a proprioceptive deficit ((Jull et al., 2007; Treleaven, 2008). Neck muscle vibration on the other hand had a smaller but also significant positive effect on joint position sense. Furthermore, in contrast to the other two interventions, vibration also significantly reduced pressure pain threshold indicating that afferent stimulation is closely related to the perception of pain. Future studies have to evaluate potential long term benefits of these different treatment strategies.

(ABSTRACT TRUNCATED)

Extrait 6<sup>e</sup> Congrès annuel de la 4S 2014 à Fribourg

**Title:** AltitudeOmics: Cerebral and muscle NIRS during exercise: 16 day acclimatisation at 5,260m

**Authors:** Bourdillon N<sup>1</sup>, Fan JL<sup>1,2</sup>, Subudhi AW<sup>3,4</sup>, Evero O<sup>3</sup>, Kayser B<sup>1</sup>, Lovering AT<sup>5</sup>, Roach RC<sup>3</sup>

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- 2 Lemanic Neuroscience Doctoral School, University of Lausanne, Lausanne, Switzerland.
- 3 Altitude Research Center, Department of Emergency Medicine, University of Colorado Denver, Aurora, Colorado, USA.
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- 5 Department of Human Physiology, University of Oregon, Eugene, Oregon, USA.

**Abstract:**

**Introduction:**

Near infrared spectroscopy (NIRS) allows for the continuous non-invasive measurement of oxy- and deoxyhaemoglobin concentrations (O<sub>2</sub>Hb & HHb) in living tissue. No study reported O<sub>2</sub>Hb and HHb in brain and muscle during intense hypoxic exercise before and after acclimatization at 5,260m. We hypothesized that acclimatization to altitude would improve both brain and muscle oxygenation at rest and during exercise.

**Methods:**

This study was part of the 'AltitudeOmics' project. 21 subjects (12 males, 9 females) were tested at sea level (SL, 130m), upon arrival at 5,260m (ALT1) and after 16 days of acclimatisation (ALT16). The exercise protocol consisted of a max test (MT, 3-min stages at 70, 100, 130, 160W and then a 15W/min ramp to Max) followed, after a recovery period, by a 5km time trial test (TT). NIRS probes (Oxymon, Artinis, Zetten, Netherlands) were located on the left prefrontal cortex and on the right vastus lateralis. Values are reported as delta compared to resting baseline, the latter being set arbitrarily at zero. Values are mean ± SD.

**Results:**

O<sub>2</sub>Hb and HHb results showed that tissue oxygenation is more affected in the brain than the muscle at ALT1 and ALT16 during exercise. The greatest muscular deoxygenation was observed at ALT1 (O<sub>2</sub>Hb = -12.9 ± 6.5 μM, HHb = 15.1 ± 9.0 μM at 160W) whilst at ALT16 (O<sub>2</sub>Hb = -6.9 ± 5.2 μM, HHb = 14.2 ± 8.0 μM at 160W) the oxygenation status tended towards the SL values (O<sub>2</sub>Hb = -8.2 ± 6.6 μM, HHb = 10.6 ± 6.0 μM at 160W). Brain NIRS at ALT16 (O<sub>2</sub>Hb = 4.6 ± 7.7 μM, HHb = 1.7 ± 3.2 μM at 160W) showed greater impediment of the oxygenation status than ALT1 (O<sub>2</sub>Hb = -2.0 ± 6.7 μM, HHb = 7.3 ± 5.5 μM at 160W) and SL (O<sub>2</sub>Hb = -4.4 ± 6.5 μM, HHb = 5.5 ± 2.5 μM at 160W). The same pattern was observed at Max for the brain: oxygenation was impeded with hypoxia and not improved by acclimatisation. By contrast, for the muscle, the oxygenation status at Max remained similar for SL, ALT1 & ALT16. The same results were found during the TT, muscle NIRS improved with acclimatisation but not brain NIRS.

**Discussion/Conclusion:**

Brain cortex oxygenation seems more affected by hypoxia than muscular oxygenation, at the same absolute submaximal workload and at maximal exercise. Furthermore, muscle oxygenation improves with acclimatisation but not brain oxygenation. How this relates to the effect of acclimatisation on submaximal exercise performance remains to be investigated.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Electroconvulsive therapy and aerobic exercise training increased BDNF and improved depressive symptoms in patients suffering from treatment-resistant major depressive disorder

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\* Both authors contributed equally to this work.

### Abstract:

**Background:** In search of more effective treatment algorithms for patients suffering from treatment-resistant major depressive disorder (MDD), research has focused on electroconvulsive therapy (ECT) and aerobic exercise (AE). Moreover, brain derived neurotrophic factor (BDNF) seems to be key in MDD. However, no research has investigated ECT and AE treatments concomitantly. The aims of the present study were therefore two-fold: To investigate in a three-arm interventional study the different effects of ECT, ECT and AE, and AE alone in patients suffering from treatment resistant MDD on 1. depressive symptoms and 2. BDNF.

**Method:** A total of 60 inpatients suffering from treatment-resistant MDD (mean age: 31 years; 31.6% female patients) were randomly assigned either to the ECT, the ECT + AE, or the AE condition. The AE condition consisted of treadmill exercise for 30 minutes, three times a week, with an intensity level of 60-75% of VO<sub>2</sub>max. Both depression severity and BDNF levels were assessed at baseline and 4 weeks later. All patients were further treated with SSRI (Selective Serotonin Reuptake Inhibitor) standard medication.

**Results:** BDNF levels increased over time in all three study conditions. After completion of the intervention program, the ECT group showed significantly higher BDNF levels compared to the ECT + AE and the AE conditions. Depressive symptoms decreased in all three study conditions over time. The combination of ECT + AE led to a significantly greater decrease as compared to the ECT or AE conditions alone. BDNF levels were not associated with symptoms of depression.

**Conclusions:** The pattern of results suggests that, first, ECT, AE and particularly the combination of ECT and AE are promising directions to treat patients suffering from treatment-resistant MDD, and that, second, it remains a matter of debate to what extent BDNF is key and a reliable biomarker for MDD.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Wo bewegen sich unsere Kinder? Objektive Erfassung der Bewegungsorte von Schweizer Primarschulkindern mittels GPS und Accelerometrie

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### Abstract:

#### Introduction:

In den letzten Jahren hat sich die physische Umwelt durch die Urbanisierung stark gewandelt. So mussten Grün- und Freiflächen zunehmend neuen Gebäuden und Strassen weichen und der Verkehr nahm stetig zu [1]. Die Forschung zum Einfluss der gebauten Umwelt auf das Bewegungsverhalten steht erst am Anfang [2], neue Studienresultate deuten aber darauf hin, dass Umweltbedingungen das Bewegungsverhalten eines Menschen entscheidend mitbeeinflussen können, positiv wie auch negativ [2; 3; 4]. Zum heutigen Zeitpunkt ist die Bedeutung körperlicher Aktivität als Voraussetzung für ein gesundes zwar allgemein Leben bekannt [5], trotzdem sind die vorhandenen wissenschaftlichen Kenntnisse über das Bewegungsverhalten von Kindern noch immer unvollständig [3; 5]. Insbesondere weiss man wenig darüber, an welchen Orten Kinder körperlich aktiv sind [6]. Trotz mangelnder wissenschaftlicher Absicherung besteht die Befürchtung, dass sich Kinder in der Schweiz immer weniger bewegen. Zwar sind die BMI-Werte der Kinder in der Schweiz seit einigen Jahren konstant, jedoch auf einem hohen Niveau [7]. Als Ursache für die zunehmende Inaktivität könnte das fehlende Angebot von Bewegungsräumen eine entscheidende Rolle spielen. Im Sinne einer verhältnisorientierten Bewegungsförderung rücken deshalb vermehrt die physische Umwelt und kindliche Bewegungsräume ins Blickfeld. In der Schweiz fehlen bis heute jedoch Studien, welche mit objektiven Messinstrumenten untersucht haben, wo Kinder körperlich aktiv sind. Ziel der vorliegenden Arbeit war deshalb, das Bewegungsverhalten der Primarschulkinder mit objektiven Messmethoden zu erfassen. Insbesondere sollte durch den Einsatz der neuartigen Kombination von Accelerometrie und GPS untersucht werden, wo sich Kinder aufhalten und an welchen Orten sie bevorzugt körperlich aktiv sind.

#### Methods:

119 Primarschulkinder der Stadt Winterthur (Alter  $12.5 \pm 0.41$ ) aus zehn unterschiedlichen Klassen nahmen zwischen Februar und April 2013 an der Untersuchung teil. Die Stichprobe setzte sich aus 68 Mädchen und 51 Knaben zusammen. Die Kinder trugen in einer regulären Schulwoche während den Wachzeiten an sieben aufeinanderfolgenden Tagen einen Bewegungsmesser GT3X (ActiGraph LLC, Florida, USA) und ein GPS-Logger (BT-Q1000XT, Qstarz, Taiwan) an der Hüfte. Zusätzlich wurde Grösse und Gewicht erhoben, sowie Alter und Wohnort der Kinder erfasst. Um das kindliche Bewegungsverhalten möglichst exakt darstellen zu können, wurde im Einklang mit vergleichbarer Literatur eine Aufnahmefrequenz von 0.1 Hz gewählt [8; 9]. Durch die Kombination der Accelerometrie- und GPS-Daten war es möglich, jedem erfassten Bewegungsort eine entsprechende Bewegungsintensität (sitzend, leicht, moderat oder anstrengend) zuzuordnen [10]. Die Analyse der Bewegungsorte wurde anschliessend in einem geographischen Informationssystem (ArgGIS, ESRI, CA, USA) durchgeführt, wobei ausschliesslich die kombinierten Daten in die Analyse einbezogen wurden. Ebenfalls wurden Nicht-Tragzeiten identifiziert und von den Berechnungen ausgeschlossen. Zur Klassifizierung der Bewegungsorte wurden mit Hilfe von Vermessungsdaten der Stadt Winterthur sechs Kategorien definiert (Zuhause, Schulanlagen, Freizeitanlagen, Strassen, Übrige, Ausserhalb des Studiengebiets). Anschliessend wurde für jedes Kind berechnet, wie hoch der absolute (in Minuten/Woche) und relative (in Prozent) Anteil an moderat-intensiver Aktivität (MVPA) an den unterschiedlichen Orten ausfällt. Ebenfalls wurde für jeden Ort ermittelt, wie hoch der prozentuale Anteil der MVPA im Vergleich zur gesamthaft an diesem Ort verbrachten Zeit ist.



### Results:

Die Kinder trugen die Messgeräte durchschnittlich an  $6.5 \pm 1.2$  Tagen während einer Dauer von  $12.2 \pm 1.8$  Stunden/Tag. Gesamthaft wurden 2'536'675 kombinierte Bewegungspunkte erfasst, was pro Kind eine durchschnittliche Anzahl von  $59.2 \pm 20.6$  Stunden/Woche ergibt. Kinder haben je ein Drittel ihrer Zeit Zuhause (37.1%) und in der Schule (28.8%) verbracht, während 14.5% der Zeit hielten sie sich auf Strassen auf. Der Aufenthalt in Parks oder Sportanlagen betrug lediglich 28.8 Minuten/Woche (0.9%). Rund 8.2% der erfassten Zeit verbrachten die Kinder in MVPA, wobei Knaben ( $353.2$  Minuten/Woche MVPA) durchschnittlich aktiver waren als Mädchen ( $286.6$  Min/Woche MVPA),  $U = 1136.0$ ,  $z = -3.2$ ,  $p < 0.01$ ). Mädchen erzielten im Vergleich zu den Knaben den grössten Anteil ihrer MVPA auf Strassen (38.1% vs. 26.1%,  $U = 1000.0$ ,  $z = -3.9$ ,  $p < 0.001$ ), wohingegen Knaben die meiste Aktivität in der Schule zeigten (34.5% vs. 31.8%,  $U = 1247.0$ ,  $z = -2.6$ ,  $p < 0.01$ ). Unter Einbezug der Aufenthaltsdauer an einem Ort zeigte sich, dass auf Strassen (17.8%) und in Freizeitanlagen (15.1%) anteilmässig am meisten Zeit in MVPA absolviert wird. Während der verbrachten Zeit auf Schulanlagen erreichten die Kinder einen Anteil von nur rund 9.6% in MVPA, Zuhause war der Anteil sogar noch kleiner (3.0%). Ein Geschlechterunterschied war insbesondere auf Schulanlagen ersichtlich (Knaben 12.0% vs. Mädchen mit 7.9%),  $U = 841.0$ ,  $z = -4.8$ ,  $p < 0.001$ .

### Discussion/Conclusion:

Die Resultate zeigen, dass Kinder einen Grossteil ihrer wöchentlichen MVPA auf Strassen und Schulhausanlagen erzielten und diese somit wichtige Bewegungsorte darstellen. Knaben absolvierten auf Schulhausanlagen mehr als einen Drittel ihrer totalen MVPA, bei den Mädchen hingegen wurde die meiste Aktivität auf Strassen gemessen. Betrachtet man für jeden Ort den Anteil der MVPA im Verhältnis zur total dort verbrachten Zeit, so zeigt sich, dass Strassen und Freizeitanlagen in besonderem Masse zu körperlicher Aktivität anregen. Die Kinder verbrachten während einer regulären Woche zwar nur sehr wenig Zeit in Freizeitanlagen, während ihrem Aufenthalt waren sie jedoch während rund einem Fünftel der Zeit körperlich aktiv. Eine mögliche Ursache für den seltenen Besuch von Parks und Sportanlagen kann dabei der Zeitpunkt der Messungen sein. Eine Studie von Oreskovic et al. (2012) zeigte, dass Kinder im Winter und Frühling nur selten in Parks und auf Spielplätzen anzutreffen sind. Der hohe Anteil körperlicher Aktivität auf Strassen kann auf aktive Transportwege zurückgeführt werden und verdeutlicht, im Einklang mit einer anderen Schweizer Studie [3], wie wichtig diese für einen aktiven Lebensstil sind. Im Vergleich zu Strassen und Freizeitanlagen ist der Anteil an MVPA unter Berücksichtigung der Aufenthaltsdauer auf Schulanlagen zwar eher klein, jedoch immer noch deutlich höher als Zuhause. Würde man nur die Zeit ausserhalb der regulären Schulstunden berücksichtigen, wäre der Anteil an MVPA wahrscheinlich bedeutend höher, da Kinder während einer Schulstunde meist inaktiv sind [12]. Wie bereits Dessing et al. (2013) beobachtet haben, zeigen die Resultate auf, dass Mädchen in der Schule signifikant weniger aktiv sind. Der Bewegungsort Schule sollte in weiteren Studien noch vertieft untersucht werden, insbesondere wäre es wünschenswert herauszufinden, welche Faktoren (Grösse der Schulanlage, Bodenflächen, Ausstattung) die körperliche Aktivität in der Schule erhöhen, speziell auch bei Mädchen. Die Studie wurde während den Monaten Februar-April durchgeführt. Da das Bewegungsverhalten saisonalen Schwankungen unterliegt, sind die Resultate nicht repräsentativ für das ganze Jahr.

### References:

1. Statistik Schweiz. (2011). Statistisches Lexikon der Schweiz. Zugriff 03.10.2012, unter <http://www.bfs.admin.ch/bfs/portal/de/index/infoteh/lexikon.html>
2. Grob, D., Biedermann, A., & Martin-Diener, E. (2009). Strukturelle Bewegungsförderung in der Gemeinde. Synthese des aktuellen Wissensstandes, Grundlagen für Handlungsempfehlungen. Herzogenbuchsee: Public Health Services.
3. Bringolf-Isler, B. (2011). Bewegungsverhalten im Alltag: Kinder und Umwelt. Dissertation, ISPM Basel, Basel.
4. Almanza, E., Jerrett, M., Dunton, G., Seto, E., & Pentz, M. A. (2012). A study of community design, greenness, and physical activity in children using satellite, GPS and accelerometer data. *Health Place*, 18(1), 46-54.

(ABSTRACT TRUNCATED)

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Reactivity to Accelerometer Measurement of Children and Adolescents

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### Abstract:

#### Introduction:

Awareness of being monitored can influence participants' habitual physical activity (PA) behavior. This reactivity effect may threaten the validity of PA assessment. Reports on reactivity when measuring the PA of children and adolescents have been inconsistent. The aim of this study was to investigate whether PA outcomes measured by accelerometer devices differed from measurement day to measurement day, and whether the day of the week and the day on which measurement started had an influence on PA outcomes.

#### Methods:

Accelerometer data (counts per minute, cpm) of children and adolescents ( $n = 2081$ ) with at least 10 hours of daily valid recording pooled from eight studies in Switzerland were investigated for effects of measurement day, day of the week and start day using mixed linear regression.

#### Results:

The first day's measurements yielded the highest activities. Cpm on the first day were significantly higher than on the following days except on the seventh day ( $p < 0.05$ ). Differences in the age-adjusted means between the first and consecutive days ranged from 23 to 45 cpm (3.6–7.1 % differences in relation the first measurement day). The day of the week was significantly related to PA ( $p < 0.001$ ), with cpm on Saturday, Sunday and Monday being significantly lower than on Tuesday through Friday. The start day was significantly related to PA ( $p < 0.05$ ) with a difference of 39.3 cpm (6.3 %) depending on whether the measurements started on a Wednesday (highest PA) or on a Saturday (lowest PA).

#### Discussion/Conclusion:

Reactivity to accelerometer measurement of PA is likely to be present to an extent of about 5 % difference on the first day of measurement compared to consecutive days and may introduce a relevant bias to accelerometer-based studies. As the day of the week and the start day significantly influence PA estimates, researchers should plan for at least one familiarization day in school-age children studies and randomly assign measurement start days.

#### References:

- Dössegger, A., Ruch, N., Jimmy, G., Braun-Fahrländer, C., Mäder, U., Hänggi, J., Hofmann, H., Puder, J. J., Kriemler, S., and Bringolf-Isler, B. (in press). Reactivity to accelerometer measurement of children and adolescents. *Medicine and science in sports and exercise*.
- Vincent, S. D. and Pangrazi, R. P. (2002). Does reactivity exist in children when measuring activity levels with pedometers? / La réactivité existe-t-elle chez des enfants lorsque que l'on mesure leur niveau d'activité à l'aide d'un podomètre? *Pediatric Exercise Science*, 14(1):56-63.
- McClain, J. J. and Tudor-Locke, C. (2009). Objective monitoring of physical activity in children: considerations for instrument selection. *Journal of science and medicine in sport / Sports Medicine Australia*, 12(5):526-533.

**Title:** A wearable system to measure speed and phase durations in classical cross-country skiing

**Authors:** Fasel B.<sup>1</sup>, Favre J.<sup>1</sup>, Chardonnens J.<sup>1</sup>, Aminian K.<sup>1</sup>

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**Abstract:**

**Introduction:**

In order to understand the biomechanics and to improve the athlete performances in cross-country skiing it is important to analyze speed and temporal phases. However, only very few studies investigated these parameters on snow as the currently used measurement techniques require heavy and complex instrumentation. For a good understanding of the biomechanics, it is important to obtain movement characteristics for each cycle independently. Measurement systems should be simple enough to allow measurements without assistance during every-day training. The goal of this study was to design and validate such a wearable system for the diagonal stride.

**Methods:**

Two inertial measurement units (Physilog®, GaitUp, CH) were attached to the left ski and left pole, respectively. Using custom algorithms, relevant temporal features, e.g. cycle and thrust (leg and arm) durations, were automatically calculated based on the measured acceleration and angular velocity. Cycle speed was estimated by integration of the forwards acceleration of the ski sensor. Biomechanical constraints of the diagonal stride were used to obtain a drift-free cycle speed. 10 athletes were recruited for an indoor validation on roller ski. A 3D camera-based system (VICON®, UK) was used as the reference system. Additionally, in-field measurements with 13 athletes were performed. These measurements were used to demonstrate the usability of the system and to assess the sensitivity of the system to changes in skiing mechanics. Testing for relationships between phase durations and speed was done using ANCOVA.

**Results:**

For all absolute parameters, small errors were obtained when comparing the system to the reference (Table 1). Furthermore, the system detected strong associations between cycle duration and relative leg thrust (normalized with respect to cycle duration) to skiing speed (Table 2). No association was found between relative arm thrust and skiing speed.

Table 1: Validation against the reference, N=1200 cycles. IQR = interquartile range

	Parameter Range	Relative Error, Median, IQR
Cycle speed	1.6 - 3.5m/s	0.05m/s, 0.10m/s
Cycle duration	1179 - 1939ms	-0.2ms, 5.9ms
Leg thrust duration	60 - 408ms	2.0ms, 4.0ms
Arm thrust duration	354 - 940ms	28ms, 32ms

**Discussion/Conclusion:**

Roller-skiing on treadmill showed the validity of the system. Additionally, the measures on snow indicated that the system can be used on snow and is sensitive enough to detect changes. The system confirmed the findings of (Nilsson, Tveit, & Eikrehagen, 2004) for a natural environment with the exception of the relative leg thrust. This difference may be due to a slightly different definition of the ski thrust phase. The resolution of the system was high, allowing investigating intercycle variations. It is important to note that the system is simple to use and can be set up by the athlete alone. Additionally to the presented parameters, the system is also able to measure swing and recovery phases not discussed in this abstract for sake of consistency.

Table 2: Sensitivity to changes

		R <sup>2</sup>	p
Speed vs. cycle duration	↘	0.93	<0.001
Speed vs. relative leg thrust	↘	0.80	<0.001
Speed vs. relative arm thrust	→	0.03	0.36

**References**

Nilsson, J., Tveit, P., & Eikrehagen, O. (2004). Effects of speed on temporal patterns in classical style and freestyle cross-country skiing. *Sports biomechanics / International Society of Biomechanics in Sports*, 3(1), 85–107. doi:10.1080/14763140408522832

**Abstractvorlage für den Nachwuchspreis; 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg****Title:**

Verletzungen beim Landen: Der Einfluss von schwachen Hüftabduktoren auf die Kinematik des Knies in der Frontalebene Landing and Injuries: the role of hip abductor fatigue on frontal plane knee kinematics

**Authors:** S. Gafner<sup>1</sup>, I. Punt<sup>1</sup>, N. Place<sup>2</sup>, S. Armand<sup>3</sup>, J.L. Ziltener<sup>3</sup>, L. Allet<sup>1</sup>

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**Abstract:****Introduction:**

A well functioning muscle corset is important for the participation in any kind of sport activities. Many popular sports like running [1], athletics [2] and team sports such as soccer [3] or handball [4] induce injuries to the lower extremity. Interestingly, most sports injuries (e.g. in soccer and rugby) occur in the second half of the competition and are thought to be fatigue induced [5]. Many studies examined the consequences of fatigue of ankle muscles on postural stability, but only few studies examined the proximal muscles of the lower extremities that are thought to be more important in balance performance [6]. Nevertheless, several authors demonstrated that hip abductor weakness and weak knee muscles lead to greater difficulties to maintain balance and postural control than weak ankle muscles [6, 7, 8]. These studies support the importance of the hip abductor strength on postural control, which is a pre requisite for being physically active. In the study of Henriksen [9] in which intramuscular hypertonic saline was injected in the gluteus medius to inhibit its activity a reduced internal hip abductor and external knee adduction moments during walking was revealed. Hip abductors (gluteus medius, the upper part of gluteus maximus, tensor fasciae latae) also have a large impact on injuries of the lower extremities [10, 11]. Diseases like patello-femoral pain syndrome (PFPS) [11], anterior cruciate ligament (ACL) ruptures [12, 13] and chronic ankle instabilities (CAI) [14] have been shown to be related to hip abductor weakness or fatigue. Knee injuries mostly occur during jumping, cutting (directional changes, lateral step) or decelerating movements [10, 12, 16]. Although some studies stated that hip abductor fatigue is related to different knee and ankle injuries, the direct effect of hip abduction fatigue on lower limb and trunk kinematics and kinetics remains unclear. Nevertheless, a recent review of Cashman et al. [16] showed, that the influence of hip abductor fatigue on these challenging movements, leading to injuries, has only barely been studied. Therefore, the present study will examine the influence of hip abductor fatigue of healthy volunteers on kinematics of the lower extremity at the moment of landing after a single leg forward jump.

**Methods:**

Sixteen healthy participants aged 18-40 years (30.25±4.34 years) were included in our study. The hip abductors of the dominant leg (the leg the participants use to kick a ball with) were fatigued in a side-lying position on the non-dominant side of the participant using a dynamic repetitive movement (30 degree hip abduction, 60 beats per minute) [17]. In accordance to the study of Patrek et al. [17], the maximum voluntary isometric contraction (MVIC) of the hip abductors has been recorded in a side-lying position with a hand-held dynamometer that was fixed on a frame. The MVIC was recorded before and after the fatigue protocol (*pre-post fatigue MVIC*), as well as at the end of the single leg forward jump test (*verification MVIC*). Knee valgus (in degree) at initial contact (IC) and the peak joint displacement (PJD) of the knee (degree) between IC and 500 ms after IC were measured using the VICON system. A one-way repeated ANOVA Data analysis was performed using SPSS version 21.0.

**Result:**

The mean pre- to post- fatigue MVIC decreased by 60.55% (pre-fatigue MVIC= 315.10±90.85 N; post-fatigue MVIC= 124.87±55.94 N). The maximum value of recovery at the end of the jump tests was 78.57 % of the pre-fatigue MVIC, which means that all participants remained sufficiently fatigued until the end of the testing procedure (pre-fatigue MVIC= 315.10±90.85 N, verification MVIC 176.60±46.69N).

Five participants landed in a knee valgus position pre- and post-fatigue (-3.39°±2.00), 9 participants landed in varus position (+5.16°±2.56) and 2 others showed a varus angle pre-fatigue (+2.12°±1.27) and a valgus angle (-0.10°±0.02) post-fatigue.

After fatigue 8 participants increased their valgus angle or decreased the varus angle at landing. The contrary is valid for the other half of the participants. The PJD increased for 6 participants (1.76°±1.28) and decreased for 7 participants (1.55°±1.06) after fatigue. Three participants showed no difference in the PJD before and after fatigue.

**Discussion/Conclusion:**

The MVIC results show that participants' hip abductor muscles really have been fatigued and remained fatigued during the whole testing session.

Contrary to our hypothesis, fatigued hip abductors did not increase the knee valgus at landing. Possible explanations could be a compensatory accentuated trunk lean to the contra-lateral side, as well as skin movement of the reflective markers during the jump task. We can conclude that after a single leg jump people do either land in a valgus or varus angle of the knee and move then either in a valgus or varus direction during the following 500ms. Hip abductor fatigue does not seem to accentuate the knee valgus position, which is related to lower limb injuries. Studying the influence of trunk lean kinematics and more challenging tasks as cutting maneuvers seems to be necessary to better understand the effect of hip abductor strength on landing mechanisms and related risk factors for injuries.

**Reference:**

- 1.Thijs, Y., Pattyn, E., Van Tiggelen, D., Rombaut, L., & Witvrouw, E. (2011). Is hip muscle weakness a predisposing factor for patellofemoral pain in female novice runners? A prospective study. *The American journal of sports medicine*, 39(9), 1877-1882. doi: 10.1177/0363546511407617
2. Alonso, J. M., Tscholl, P. M., Engebretsen, L., Mountjoy, M., Dvorak, J., & Junge, A. (2010). Occurrence of injuries and illnesses during the 2009 IAAF World Athletics Championships. *British journal of sports medicine*, 44(15), 1100-1105. doi: 10.1136/bjism.2010.078030
3. Engebretsen, A. H., Myklebust, G., Holme, I., Engebretsen, L., & Bahr, R. (2008). Prevention of injuries among male soccer players: a prospective, randomized intervention study targeting players with previous injuries or reduced function. *The American journal of sports medicine*, 36(6), 1052-1060.
- 4.Habelt, S., Hasler, C. C., Steinbruck, K., & Majewski, M. (2011). Sport injuries in adolescents. *Orthopedic reviews*, 3(2), e18. doi: 10.4081/or.2011.e18
5. Gabbett, T. J. (2000). Incidence, site, and nature of injuries in amateur rugby league over three consecutive seasons. *British journal of sports medicine*, 34(2), 98-103.
- 6.Salavati, M., Moghadam, M., Ebrahimi, I., & Arab, A. M. (2007). Changes in postural stability with fatigue of lower extremity frontal and sagittal plane movers. *Gait & posture*, 26(2), 214-218. doi: 10.1016/j.gaitpost.2006.09.001
7. Gribble, P. A., & Hertel, J. (2004). Effect of lower-extremity muscle fatigue on postural control. *Archives of physical medicine and rehabilitation*, 85(4), 589-592.
8. Negahban, H., Etemadi, M., Naghibi, S., Emrani, A., Shaterzadeh Yazdi, M. J., Salehi, R., & Moradi Bousari, A. (2012). The effects of muscle fatigue on dynamic standing balance in people with and without patellofemoral pain syndrome. *Gait & posture*. doi: 10.1016/j.gaitpost.2012.07.025
9. Henriksen, M., Aaboe, J., Simonsen, E. B., Alkjaer, T., & Bliddal, H. (2009). Experimentally reduced hip abductor function during walking: Implications for knee joint loads. *Journal of biomechanics*, 42(9),1236-1240. doi: 10.1016/j.jbiomech.2009.03.021

(ABSTRACT TRUNCATED)

**Title:**

Bioceramic fabrics improve handstand stability in expert gymnasts

**Authors:** Gianocca V<sup>1</sup>, Cian C<sup>2</sup>, Guerraz M<sup>2</sup>, Bresciani JP<sup>1</sup>.

<sup>1</sup>University of Fribourg, Department of Medicine, Fribourg, Switzerland

<sup>2</sup>Laboratoire de Psychologie et NeuroCognition, Grenoble, France

**Abstract:**

**Introduction:**

Bioceramic fabrics have been claimed to improve blood circulation, thermoregulation and muscle relaxation, thereby also improving muscular activity. Here we tested whether bioceramic fabrics have an effect of postural control and contribute to improve postural stability.

**Methods:**

Fourteen confirmed gymnasts having more than ten years of experience in gymnastics competition were instructed to maintain a handstand hold for five seconds and sway as little as possible. Postural oscillations were measured using a force platform with four strain gauges that recorded the displacements of the center of pressure (CoP) in the horizontal plane. In half of the trials, the gymnast wore a full-body second skin suit containing a bioceramic layer. In the other half of the trials, they wore a 'placebo' second skin suit that had the same cut, appearance and elasticity as the bioceramic suit but did not contain the bioceramic layer. Half of the gymnasts started the experiment with the bioceramic suit, and the other half with the placebo suit.

**Results:**

On average, the total surface of the displacements of the CoP and the amplitude of these displacements along the lateral as well as the antero-posterior axis were significantly smaller when the gymnasts were wearing the bioceramic suit than when they were wearing the placebo suit. The same pattern was observed for twelve out of the fourteen gymnasts that participated in the experiment.

**Discussion/Conclusion:**

The results suggest that bioceramic fabrics do have an effect on postural control and improve postural stability.

**Title:**

Evaluation du nouveau laboratoire de routine Swiss Olympic chez les athlètes suisses: premières données

**Authors:** Gojanovic B.<sup>1</sup>, Colombani P.C.<sup>1</sup>, Gassmann N.<sup>2</sup>, Noack P.<sup>1</sup>

<sup>1</sup>Haute Ecole Fédérale du Sport Macolin HEFSM, <sup>2</sup>Swiss Olympic

**Abstract:**

**Introduction:**

L'examen d'analyse du sang chez l'athlète se pratique de routine dans le but de détecter des carences ou anomalies qui pourraient être corrigées ou traitées alors que l'athlète est encore dans une phase asymptomatique. En 2012 est entré en vigueur le nouveau laboratoire de routine Swiss Olympic qui s'applique à tous les athlètes d'élite lors des examens médicaux annuels recommandés. Il manque dans la littérature des données sur les valeurs sanguines de base chez les athlètes en général et en Suisse en particulier, et ce projet cherche avant tout à décrire la situation des athlètes suisses.

**Méthodes:**

Les centres et bases médicales reconnus par Swiss Olympic (SOMC et SOMB) ont été invités dès le 1.1.2012 à transmettre sur une base volontaire les résultats du laboratoire de leurs athlètes de manière standardisée au SOMC de Macolin. Une sélection des données reçues pendant une première période de 18 mois a été analysée.

**Résultats:**

Les 813 analyses reçues (38 % femmes) provenaient de 10/12 SOMC (63 % des données) et 8/22 SOMB. Les athlètes avaient  $20.8 \pm 5.7$  ans, dont 128 (16 %) avaient moins de 16 ans. 46 sports étaient représentés (dont 25 avec <10 analyses). Football (78), ski alpin (64) et hockey sur glace (64) étaient les plus représentés. La moyenne ( $\pm$  écart type) des données analysées était:

Hémoglobine : ♂  $148.3 \pm 10.7$  g/L (104 valeurs <140 g/L, 2 <120 g/L), ♀  $135.8 \pm 9.0$  g/L (10 <120 g/L, 2 <110 g/L). Au total 13 % anémies selon normes du laboratoire.

Ferritine :  $76 \pm 51$  mcg/L (37 % <50 mcg/L, 15 % <30 mcg/L). Chez les <16 ans, 46 % des ♂ et 38 % des ♀ avaient une ferritine <30 mcg/L.

Vitamine B12 : 102 (16 %) avaient une carence (<200 pmol/L), 182 (28%) étaient dans la zone grise (200-300 pmol/L). Les mesures complémentaires de holo-transcobalamine lors de «zone grise » ont révélé une valeur insuffisante dans 14 cas (<40 pmol/L).

Vitamine D<sub>3</sub> :  $70.7 \pm 29.1$  nmol/L, 62 % <75 nmol/L (39 % entre 50-75 nmol/L, 21 % entre 25-50 nmol/L et 2 % <25 nmol/L). La variation saisonnière était d'environ 20 %. 72 % des <16 ans avaient au moins une insuffisance en Vitamine D<sub>3</sub> (<75 nmol/L).

**Discussion:**

Cette analyse de départ montre quelques éléments importants pour la pratique, avec notamment un nombre très élevé de jeunes athlètes ayant des valeurs de ferritine et de vitamine D<sub>3</sub> basses, bien qu'ils soient asymptomatiques. La question des normes de référence et de l'attitude de supplémentation se pose clairement et doit être discutée par les experts, en particulier les seuils de supplémentation pour la ferritine, actuellement donnés à 50 mcg/mL, ce qui semble trop haut.

**Title:**

The costume color affects the evaluation of performance in ballet dancing

**Authors:** Greca M<sup>1</sup>, Rouvenaz A<sup>1</sup>, Breidt M<sup>2</sup>, Bresciani JP<sup>1</sup>.

<sup>1</sup>University of Fribourg, Department of Medicine, Fribourg, Switzerland

<sup>2</sup>Max Planck Institute for Biological Cybernetics, Tuebingen, Germany

**Abstract:**

**Introduction:**

Color has been shown to affect athletes' behavior and performance in various sports. Here we tested whether the color of the costume worn by the dancer in ballet dancing can alter the evaluation of the performance by persons watching / judging it.

**Methods:**

An expert dancer wearing a full-body second skin costume including a hood performed the same forty-second choreography in three slightly different ways. The three productions were video-recorded and the color of the costume selectively modified using chroma-keying technique. Three different costume colors were used (cyan, red and green), for a total of nine performance-color combinations / footages. Sixteen participants were presented with the footages and asked to evaluate how much passion was expressed in the dancer's performance. Two different methods were used for the evaluation, namely a Likert scale and two-alternative forced choices using paired-comparisons.

**Results:**

Irrespective of the costume color, the three executions of the choreography were 'ranked' according to the passion expressed, and the ranking was consistent across the two evaluation methods. This shows that the participants were able to evaluate the dancing performance and that the evaluation methods were reliable. Importantly, both evaluation methods indicated that the performance was 'perceived' as expressing significantly less passion when the costume of the dancer was cyan as compared to red and green.

**Discussion/Conclusion:**

The results suggest that in artistic sports such as dance, rhythmic gymnastics or figure skating, the color of the costume worn by the athletes is likely to influence the evaluation of the performance. Further research will assess whether the color of the costume also biases the evaluation of expert judges.



## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Validity and reliability of maximal strength assessment of knee flexors and extensors using elastic bands

**Authors:** Guex K<sup>1</sup>, Daucourt C<sup>2</sup>, Borloz S<sup>2</sup>

<sup>1</sup>ISSUL Institute of Sport Sciences, University of Lausanne, <sup>2</sup>Swiss Olympic Medical Center, CHUV-DAL

### Abstract:

#### Introduction:

Recovering muscular strength is one of the most important factors in sport rehabilitation. In order to reach the defined goal (e.g. maximal strength, hypertrophy), different protocols specifying the number of repetitions and sets, with a load selected in percentage of the maximal strength have been described. During rehabilitation, this maximal strength may change rapidly and, thus should be tested repeatedly in order to adjust the loads. Therefore, an easy, valid and reliable assessment of maximal strength is crucial for an efficient muscular rehabilitation. Isokinetic dynamometry is considered as the "gold standard" method for assessing muscular strength. However, availability of this evaluation system is limited mainly because of its important cost. With free weights or on fitness equipments, maximal strength can be found using the one repetition maximum (1-RM) test. However, in the context of rehabilitation, this assessment could be inappropriate, since an attempt using maximum resistance is required. Therefore, repetitions to fatigue test has been proposed. This method uses a prediction equation to find the 1-RM through a submaximal testing based on the practically linear relationship between strength and anaerobic endurance for set up to 10 repetitions (Brzycki, 1993). This method was shown to be accurate to predict 1-RM (LeSuer, McCormick, Mayhew, Wasserstein, & Arnold, 1997). Elastic bands are commonly used during rehabilitation for muscular strengthening. Thera-Band® has developed bands with different color-coded resistance levels. For each color, this resistance can be measured in kilogram depending on the percentage that the band is stretched from its resting length (Page, Labbe, & Topp, 2000). Thus, muscular strength could be assessed using elastic bands. Since fitness equipments are not necessary available in the field, this would be a useful and inexpensive way to determine maximal strength. Therefore, the aim of the present study was to determine the validity and reliability of maximal strength assessment of knee flexors and extensors using elastic bands in healthy subjects.

#### Methods:

**Participants:** Twenty-two healthy recreational athletes (10 women, 12 men;  $31.3 \pm 7.0$  yrs,  $175.5 \pm 8.5$  cm,  $70.7 \pm 12.9$  kg) were recruited for this study. Ethical approval was obtained from the local committee on human research. Participants signed an informed consent after explanation of the study protocol, data collection procedures and significance of the study objectives.

**Procedures:** During the first visit, maximal strength of knee flexors and extensors was assessed using elastic bands (Thera-Band GmbH, Hadamar, Germany). Then, a familiarization on an isokinetic dynamometer (Biodex System 2, Biodex Medical Systems, Shirley, New York, USA) was performed. Seven days after, maximal strength was assessed using elastic bands following the same procedure. Then, maximal isokinetic strength of knee flexors and extensors was assessed on the isokinetic dynamometer. Participants were all tested on their dominant side. All tests were performed on the Biodex seat.

**Maximal strength assessment using elastic bands:** Thera-Band® elastic bands provide a consistent and linear increase in resistance with elongation across all colors. Regression equations were proposed to quantify this resistance in kilogram based on the percentage of elongation (Page et al., 2000). These equations were used to quantify the resistances "lifted" by the participants at the end of ROM. Prior to the testing period, 15 different elastic bands were prepared (Resistances ranging from 17 to 57 kg for knee flexors and from 23 to 77 kg for knee extensors). To assess knee flexors, participant were sitting on the Biodex seat facing a wooden bar with their knee at 0° of flexion. The elastic band was fixed just proximal to the lateral malleolus and on the wooden bar 90 cm above the knee and 60 cm in front of this last. To assess

knee extensors, participant were sitting on the Biodex seat facing away the wooden bar with their knee at 90° of flexion. The elastic band was fixed just proximal to the lateral malleolus and on the wooden bar 40 cm below the knee and 160 cm behind this last. One-RM of knee flexors and extensors was predicted using repetitions to fatigue test. Participants were asked to perform a maximum of repetitions with an intermediate resistance elastic band. If they succeeded to perform 10 repetitions, a greater resistance elastic band was selected for the next attempt. This procedure was repeated ( $\leq 5$  attempts) until the participant succeeded to perform 10 or less repetitions. The following prediction equation was then used (Brzycki, 1993):  $1RM = \text{resistance in kg} / (1.0278 - [0.0278 \times \text{reps}])$ .

Isokinetic assessment: The dynamometer was calibrated according to the manufacturer's recommendations and following the instructions for optimal reproducibility. The lever arm shin-pad was positioned just proximal to the lateral malleolus. During the first visit, participants performed a familiarization, which consisted of 10 concentric knee flexion-extensions at 60°-s-1. At the end of the second trial, they performed 5 maximum concentric knee flexion-extensions at 60°-s-1. Peak torque (PT) value for each movement was considered as the greatest PT production over the 5 repetitions. Statistical analysis: Validity of maximal strength assessments using elastic bands was explored by calculating Pearson's correlation coefficients between 1-RM of the second trial and concentric PT. Relative reliability of maximal strength assessments using elastic bands was calculated with the intraclass correlation coefficient (ICC2,1) between the two trials. Absolute reliability was calculated with the coefficient of variation (CV). Absolute reliability was, moreover, assessed with the standard error of measurement (SEM), which provide an estimate of measurement error. SEM values were finally used to determine the minimal detectable change (MDC) to be considered "real".

#### **Results:**

The validity of the proposed method was found to be very high ( $r = 0.93$  for both knee flexors and extensors). The relative reliability was found to be very high (ICC = 0.98 and 0.99 for knee flexors and extensors, respectively), while absolute reliability was also very satisfying (CV = 3.44% and 2.33%; SEM = 1.70 kg and 2.16 kg; MDC = 4.73 and 5.99 kg for knee flexors and extensors, respectively).

#### **Discussion/Conclusion:**

The present study demonstrated that using elastic bands to assess maximal strength of knee flexors and extensors is valid and reliable in healthy people. In order to minimize the risk of injuries, it was preferred to use the repetitions to fatigue test than a "direct" 1-RM assessment. Classically, this type of "indirect" assessment is performed on fitness equipments and is shown to be a valid method to predict 1-RM (LeSuer et al., 1997). It has also been shown to be valid in regard to the "gold standard", since 8-RM test (i.e. an alternative to the repetitions to fatigue test) performed on a leg extension curl was found to be highly correlated (0.85) with PT at 60°-s-1 on an isokinetic dynamometer (Taylor & Fletcher, 2013). This result is in line with our observations and suggests that the proposed maximal strength assessment using elastic bands is a valid method to assess maximal strength. Both test-retest relative and absolute reliabilities of maximal strength assessment using elastic bands were found to be very satisfying. For knee flexors and extensors, ICC values were largely  $> 0.80$ , which was suggested to be acceptable for clinical work (Currier, 1990). CV values indicated also a good reliability, since they were both largely lower than the analytical goal of 10% (Stokes, 1985). Finally, SEM values were both very low ( $\sim 2$  kg for both knee flexors and extensors). A previous investigation has found ICC values  $\geq 0.97$  between "direct" 1-RM on hamstring curl and leg extension curl in two separate trials (Levinger et al., 2009). This is in line with our results and suggests that using elastic bands to test maximal strength is highly reliable and allows finding 1-RM as well as using fitness equipments. In conclusion, the present study suggests that Thera-Band® is a valid and reliable alternative to the use of fitness equipments to test maximal strength of knee flexors and extensors in healthy subjects. The ease of use, accessibility and low cost of elastic bands should allow regular assessment during the rehabilitation process.

(ABSTRACT TRUNCATED)

## Abstract zur 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Ice skating promotes postural control in children

**Authors:** Keller M<sup>1</sup>, Röttger K<sup>2</sup>, Taube W<sup>1</sup>.

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<sup>2</sup>Department of Sport and Sport Science, University of Freiburg, Freiburg, Germany

### Abstract:

#### Introduction:

High fall rates causing injury and enormous financial costs are reported for children (Mathers, Penm, Carter, & Stevenson, 1999). However, only few studies investigated the effects of balance training in children and these studies did not find enhanced balance performance in postural (transfer) tests (Donath et al., 2013; Granacher, Muehlbauer, Maestrini, Zahner, & Gollhofer, 2011). Consequently, it was previously speculated that classical balance training might not be stimulating enough for children to perform adequately these exercises. Therefore, the aim of this study was to evaluate the influence of ice skating as an alternative form of balance training.

#### Methods:

Volunteers were assigned to an intervention (INT: 13.1±0.4 years) or a control group (CON: 13.2±0.3 years). INT participated in eight sessions of ice skating during education lessons, whereas CON participated in normal physical education. Balance performance was tested before and after training with different tests: i) a Functional Reach Test (FRT) measuring the maximal forward reach and ii) an instable platform enabling measurements in static and dynamic conditions.

#### Results:

Groups did not show different performances before training (all values:  $p > 0.3$ ). However, there was a group x time effect ( $F_{1,28} = 5.37$ ;  $p = 0.028$ ) demonstrating significant improvements in balance performance when tested on the instable platform in the INT group whereas the CON group did not show any significant adaptations. Furthermore, the two groups differed significantly with respect to their changes in FRT from pre- to post-test measurements ( $F_{1,28} = 14.96$ ;  $p < 0.001$ ), meaning that only subjects of INT showed a significantly increased reaching distance.

#### Discussion/Conclusion:

This is the first study showing significantly enhanced balance performance after ice skating in children. More importantly, participating children improved static and dynamic balance control in postural tasks that were not part of the training. Factors that might explain why we found significant improvements in postural transfer tasks whereas previous studies did not are: i) the appealing character of ice skating with increasing task complexity and ii) the age of our volunteers that were on average 3 years (Donath et al., 2013) or 6 years (Granacher et al., 2011) older than participants of previous studies.

#### References:

- Donath, L., Roth, R., Rueegge, A., Groppa, M., Zahner, L., & Faude, O. (2013). Effects of Slackline Training on Balance, Jump Performance & Muscle Activity in Young Children. *Int J Sports Med*. doi: 10.1055/s-0033-1337949
- Granacher, U., Muehlbauer, T., Maestrini, L., Zahner, L., & Gollhofer, A. (2011). Can balance training promote balance and strength in prepubertal children? *J Strength Cond Res*, 25(6), 1759-1766. doi: 10.1519/JSC.0b013e3181da7886
- Mathers, C., Penm, R., Carter, R., & Stevenson, C. (1999). Health System Costs of Injury, Poisoning, and Musculoskeletal Disorders in Australia, 1993–94. Canberra, Australia: Australian Institute of Health and Welfare.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Seeing or Perceiving? The Relevance of the Quiet Eye Location

**Authors:** Klostermann, A.<sup>1</sup>, Hossner, E.-J.<sup>1</sup>

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### Abstract:

#### Introduction:

The functionality of the final fixation before movement initiation (Quiet Eye, QE) for superior motor performance is well documented (Vickers, 2007). However, underpinning mechanisms have only been studied rudimentarily. Among others, it remains unclear whether the perception of visual information (e.g., the position of a target) within the QE period conditions the phenomenon's efficiency strengthening a cognitive explanation for this phenomenon. Consequently, in a targeting task it was tested whether the duration of presented target information within final fixation duration of different lengths would differentially affect throwing performance. It was expected to find an efficiency of the QE as function of target presentation duration rather than of final fixation duration.

#### Methods:

In a within-subject design, final fixation onset and target onset were manipulated using an experimental paradigm in which 20 participants had to throw balls as accurately as possible at a virtual target disk (cf. Klostermann et al., 2013). The manipulation consisted of a peripherally displayed flicker cue to evoke a final fixation earlier or later in time at one of four possible target positions at which the target disk was presented correspondingly either immediately or delayed relative to the expected fixation onset. As variables QE onset and offset – i.e. beginning and end of the final fixation on the target position – as well as the radial error (RE) were calculated and analyzed with a 2 (final fixation onset) x 2 (target onset) ANOVA with repeated measures and planned t-tests.

#### Results:

The QE manipulation was successful as independent of target onset, earlier QE onsets were found in the early compared to the late final fixation onset condition,  $F(1, 19) = 35.5, p < .01, \eta_p^2 = .65$ . No differences in QE offset were revealed. Above that, the RE was significantly lower in the immediate compared to the delayed target onset condition,  $F(1, 19) = 4.5, p < .05, \eta_p^2 = .19$ . Finally, a significant final fixation onset x target onset interaction was found,  $F(1, 19) = 5.3, p < .05, \eta_p^2 = .22$ , resulting from performance differences between the early final fixation onset / delayed target onset condition and the remaining three conditions (all  $ps < .05$ ) which did not differ from each other (all  $ps > .50$ ).

#### Discussion:

The results support the suggested relevance of perceiving target information within the QE period as throwing performance solely depended on the duration in which information about the actual target position could be perceived. This finding indicates that it is not the length of the QE duration per se that matters but the efficient use of this duration for processing task relevant visual information. Most notably, a comparison of the two conditions in which only the final fixation but not the target presentation duration differed particularly supports this interpretation since no performance differences appeared. Further evidence was presented, emphasizing the functionality of the QE for offline parameterization processes in the framework of a cognitive explanation.

#### References:

- Klostermann, A., Kredel, R., & Hossner, E.-J. (2013). The "Quiet Eye" and motor performance: Task demands matter! [Electronic Version]. *Journal of Experimental Psychology: Human Perception & Performance*. doi: 10.1037/a0031499
- Vickers, J. N. (2007). *Perception, cognition, and decision training. The quiet eye in action*. Champaign, IL: Human Kinetics.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Präzisionsleistungen im Olympischen Luftgewehrschiessen

### Authors:

Ralf Kredel<sup>1</sup>, Dino Tartaruga<sup>1,2</sup>, Ruth Siegenthaler<sup>2</sup> & Ernst-Joachim Hossner<sup>1</sup>

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### Abstract:

Präzisionsleistungen im (Luftgewehr-)Schiessen wurden im Laufe der letzten 100 Jahre in einer Reihe wissenschaftlicher Forschungsarbeiten thematisiert (z.B. Zatsiorsky & Aktov, 1990). Dabei wurde eine Vielzahl an Variablen mit vermutetem Einfluss auf die Schussleistung in den Blick genommen. Die Untersuchung der behaupteten Wirkmechanismen selbst blieb jedoch in der Regel aus – sicher nicht zuletzt zu begründen durch die methodischen Schwierigkeiten einer ausreichend genauen Positionsbestimmung des Gewehrs.

Das vorliegende Projekt zielt aus diesem Grund auf die empirische Untersuchung genau solcher mündungsschwankungsbegründender Mechanismen ab, um sie in einen kausalen Zusammenhang einbinden zu können. Zur Untersuchung solcher Wirkungsketten wurde ein biomechanisches Messkonzept erarbeitet und mit einem Prototyp zur Erfassung gewehrnaher, dynamischer Messgrößen realisiert. Die Besonderheit des Ansatzes liegt darin, dass sich die Analysen nicht auf blosse Zusammenhänge zwischen potentiellen „distalen“ Einflussgrößen (bspw. Gleichgewichtsfähigkeit) und summativen Leistungskennziffern (bspw. Schussresultat in Ringen) beschränken (vgl. z.B. Era, Konttinen, Mehto, Saarela & Lyttinen, 1996), sondern dass resultierende Abweichungen vom Zielscheibenzentrum auf Position und Ausrichtung des Gewehrs und diese wiederum auf das Gewehr ausgeübte Kräfte und Momente zurückgeführt werden können. Die vollständige Betrachtung der Wirkungskette wird als relevant erachtet, da sich Fehler aufgrund „distaler“ Varianzen keineswegs linear über die folgenden Schritte fortpflanzen müssen, sondern vielmehr von – ggf. sich sogar kompensierenden – Interaktionswirkungen auszugehen ist. Aus den Ergebnissen lassen sich Konsequenzen für die Gestaltung des leistungsorientierten Nachwuchstrainings gleichermaßen ableiten wie individuelle Trainingsempfehlungen, letzteres zudem als Grundlage für potentielle Maßnahmen der trainingswissenschaftlichen Begleitforschung, für die mit dem entwickelten onlinefähigen System bereits die apparativen Voraussetzungen geschaffen wurden.

### References:

Zatsiorsky, V. M. & Aktov, A. V. (1990). Biomechanics of highly precise movements: The aiming process in air rifle shooting. *Journal of Biomechanics*, 23, 35–41.

Era, P., Konttinen, N., Mehto, P., Saarela, P. & Lyttinen, H. (1996). Postural stability and skilled performance – a study on top-level and naive rifle shooters. *Journal of Biomechanics*, 29, 301–306.

**Titel:**

**Das neue Fitnessgerät SensoProTrainer®: Effekte einer vierwöchigen Trainingsintervention auf die Ausdauer- und Gleichgewichtsfähigkeit.**

**Autoren:** Messerli, M<sup>1</sup>, Kershaw, S<sup>1</sup>, Keller, M<sup>1</sup>, Taube, W<sup>1</sup>

<sup>1</sup>Einheit für Bewegungs- und Sportwissenschaften, Universität Freiburg, Schweiz

**Zusammenfassung:**

**Einleitung:**

Physische Inaktivität ist ein weltweit ernst zu nehmendes Problem. Unglücklicherweise ist diese Inaktivität, welche in den letzten Jahrzehnten speziell in den Industrienationen immer mehr zugenommen hat, mit einem erhöhten Risiko verbunden an Krankheiten wie Diabetes, Bluthochdruck, koronare Herzerkrankungen, etc. zu erkranken (Knight, 2012). Aus diesem Grund ist es aus gesundheits- und kostenpolitischer Sicht unausweichlich, sitzenden Aktivitäten mittels geeigneter Trainingskonzepte zu begegnen. Das neue Fitnessgerät SensoProTrainer® (SPT) kombiniert Ausdauer- und Gleichgewichtstraining auf eine gelenksschonende Art und Weise und ist durch seine Vielfältigkeit sowohl für Anfänger als auch für Fortgeschrittene geeignet. Die hier aufgeführte Studie untersuchte die Effekte eines vierwöchigen Trainings mit dem SPT auf die Ausdauer- sowie Gleichgewichtsfähigkeit.

**Methoden:**

Insgesamt 30 wenig sportlich aktive Probandinnen und Probanden ( $23.2 \pm 2.7$  Jahre;  $170.6 \pm 8.8$  cm;  $66.5 \pm 12.7$  kg) wurden in eine Interventionsgruppe (IG) und eine Kontrollgruppe (KG) eingeteilt (IG: elf Frauen, vier Männer; KG: elf Frauen, vier Männer). Die Prä- und Post- Tests umfassten Gleichgewichtstests und einen Rampentest zur Erfassung der Ausdauerleistungsfähigkeit. Die Gleichgewichtsfähigkeit wurde in einer Bedingung mit externer Perturbation und im ungestörten Stand auf der instabilen Unterstütsungsfläche des Posturomeds™ evaluiert. Zudem wurde die maximale Ausdauerleistung auf dem Laufband getestet. Beginnend bei 5.4 km/h wurde die Geschwindigkeit jede Minute um 0.6 km/h erhöht. Der Testabbruch erfolgte bei vollständiger Erschöpfung. Nach den Prä- Tests bewältigte die IG ein vierwöchiges Training auf dem SPT (dreimal pro Woche 30 Minuten), das Gleichgewichts- und Ausdauerübungen mit HIT- Charakter kombinierte. Nach diesen vier Wochen wurden alle Probandinnen und Probanden erneut getestet.

**Resultate:**

Die Varianzanalyse (ANOVA) des Gleichgewichtstests zeigte einen Gruppe\*Zeit- Interaktionseffekt ( $F_{1,28}=7.53$ ;  $p=0.01$ ). Die IG verzeichnete eine signifikante Verbesserung in der Bedingung ohne Perturbation ( $p=0.035$ ) und einen Trend zu einer Verbesserung in der Bedingung mit Perturbation ( $p=0.078$ ). Bei der KG wurde kein signifikanter Unterschied gefunden.

Die ANOVA des Ausdauerleistungstests ergab ebenfalls einen signifikanten Gruppe\*Zeit- Interaktionseffekt ( $F_{1,28}=6.40$ ;  $p=0.017$ ). Die IG verbesserte ihre maximale Laufgeschwindigkeit hochsignifikant ( $p<0.001$ ), wohingegen die KG eine unveränderte Laufleistung zeigte.

**Diskussion/Konklusion:**

Das Training auf dem SPT hat eine Verbesserung der Gleichgewichts- und Ausdauerfähigkeit zur Folge. Das neue Fitnessgerät eignet sich somit zur simultanen Schulung zweier elementarer Basisfähigkeiten. Da sich der zeitliche Aufwand pro Training in Grenzen hält und sich schnell Effekte zeigen, scheint das Gerät gut geeignet, um den negativen Auswirkungen von Inaktivität entgegenzuwirken.

**References:**

Knight, J. A. (2012). Physical inactivity: associated diseases and disorders. *Ann Clin Lab Sci*, 42(3), 320-337.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Possible interventions of the ski and ski boot to reduce knee injuries in recreational alpine skiing

**Authors:** Michel FI<sup>1</sup>, Lehner S<sup>2</sup>, Senner V<sup>2</sup>.

<sup>1</sup>Sports Research Division, bfu-Swiss Council for Accident Prevention, Berne, Switzerland

<sup>2</sup>Department of Sport Equipment and Materials, Technische Universität München, Munich, Germany

### Abstract:

#### Introduction:

Although the total incidence of alpine skiing injuries has shown a steady downward trend since the late 1970s it is noticeable that knee injuries did not follow this positive trend. Among the level III injuries, only severe knee sprains declined since the 1990, which is generally attributed to the shortening of the ski length that accompanied the introduction of the shaped skis. Anterior collateral ligament sprains represent the highest injury rate among skiers. The proportion of knee injuries remains very high compared to the total incidence of injuries and continues to be the central topic for prevention in alpine skiing (Senner et al., 2013). Hence, the goal of the literature review was to elaborate and discuss how modifications of the ski and boot might alleviate the risk of knee injuries.

#### Methods:

The comprehensive analysis of the current situation regarding knee injuries in relation to ski equipment was carried out in which, alongside scientific papers and "grey literature", consideration was also given to patents and international standards as well. The PubMed literature search using the MeSH terms "Skiing AND knee AND injury AND (binding OR boot OR ski)" was performed to obtain relevant articles published in this field (n=142). Moreover, in search for additional information, all reference lists of the papers retrieved were checked manually.

#### Results:

Regarding the technical component "ski" the following design parameter seems to have an influence on knee injuries: sidecut radius, ski length, bending stiffness of the rear part of the ski (e.g. predetermined breaking point behind the binding), height of the ski in the area of the binding, state of preparation, ski edge profile, pretension/rocker technology, mass/mass distribution, bending stiffness in general, torsional stiffness as well as cushioning including vibration control. In the "ski boot", the height of the upper, the boot liner, the position on the ski and the shaft stiffness may play a role. Concerning shaft stiffness the optimisation of "soft boots" (anterior direction) as well as a flexible rear spoiler (posterior direction) could be an approach. Beside the differentiation by technical components as well as by design parameters, the presentation of intervention strategies could also be according to the mode of action. For example, the discussion could have examined the potential interventions for each degree of freedom. This could then relate to ski interventions (e.g. nominal breaking point), the binding interventions (e.g. horizontal release) and boot interventions (e.g. flexible rear spoiler). These considerations are intended to illustrate the complexity of the interaction and the associated possibilities for optimising ski equipment to reduce knee injuries. The interventions could cover various approaches that can range from technical solutions, via standardization processes through to awareness raising/educational work.

#### Discussion/Conclusion:

In terms of the possible realization of interventions an interaction between trade and industry, academic fields (engineering, biomechanics, material sciences, medicine, sports science) and public institutions (e.g. public health sector, standard committees) as well as media and sports organisations at national and international levels is necessary. Additionally, more research is needed for the future development and implementation of intervention strategies to prevent knee injuries in alpine skiing including the analysis and detailed description of relevant injury mechanisms.

#### References:

Senner V, Michel FI, Lehner S, Brügger O. (2013). Technical possibilities for optimising the ski-binding-boot functional unit to reduce knee injuries in recreational alpine skiing. *Sports Eng*, 16: 211-228.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

The mechanics of the somersault rate: The comparison of experimental and simulation data

**Authors:** Piccinelli D<sup>1</sup>, Staudenmann D<sup>2</sup>.

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<sup>2</sup>Movement and Sport Science, Department of Medicine, University of Fribourg, Switzerland

### Abstract:

#### Introduction:

It has been shown that the somersault rate can be influenced (i) by the angular momentum conservation, and (ii) by a change in articulated configuration (actio-reactio) between neighboring segments [1], which we will call a "pseudo-rotation". The aim of this study was to quantify the effect of the different mechanical mechanisms on the somersault rate.

#### Methods:

**Experiment:** An athlete had to execute a somersault over a force plate. We measured whole body kinematics (Dartfish) and ground reaction force to determine the forces during takeoff and landing. **Simulation:** An adapted human model was generated using SimMechanics (Matlab). It consisted of four segments that were linked together via frictionless hinge joints, which realistically represent inertial properties of the human body [2]. We used the model in a forward dynamics mode. Three conditions were simulated: First, we tested our model against the model of Fröhlich [1] in pseudo-rotation mode (i.e. without initial angular velocity). Fröhlich tested a suite of six movements resulting in an overall change in chest angle ( $\alpha_c$ ) of about  $80^\circ$  [1]. The difference between our model and Fröhlich's model was tested using the difference between angles ( $\Delta\alpha_c$ ). Second, the kinematic results of the experiment were given as input to the model in order to test  $\alpha_c$  and to quantify the somersault rate of the athlete. The somersault was divided into 3 equal time phases lasting about 350ms. We calculated the mean  $\Delta\alpha_c$  in each phase to compare experimental to simulation data. Finally, in order to study the rate of the pseudo rotation during the somersault, we adapted the second simulation without initial angular velocity. We extracted the mean of  $\alpha_c$  over the same three time phases.

#### Results:

The first test comparing our model and Fröhlich's six movement in pseudo rotation mode, showed a difference of  $\Delta\alpha_c = 7.43 \pm 6.14^\circ$ . For the second test comparing the experiment and our model, we found  $\alpha_{c1} = 0.08^\circ$ ,  $\alpha_{c2} = 0.126^\circ$  and  $\alpha_{c3} = 0.12^\circ$  for the three time phases. The last test, which is the same as the second simulation but without the initial torque, provided  $\alpha_{c1} = 0.146^\circ$ ,  $\alpha_{c2} = -0.134^\circ$  and  $\alpha_{c3} = -0.166^\circ$ .

#### Discussion/Conclusion:

The current model showed a representative estimation of somersault rate. A comparison to a previous model indicated a deviation of about  $7.4^\circ$  when a series of six movements was simulated. As illustrated by Fröhlich and showed in our model, it is indeed possible to change the orientation of the chest without an initial angular velocity. The second test showed that the current model could accurately simulate somersault rate as compared to experimental data. As shown, the athlete when performing a backward somersault does not use pseudo-rotation. Our third test clearly shows that he didn't use this effect to additionally influence somersault rate. The athlete exploited exclusively the conservation of angular momentum.

#### References:

1. Fröhlich C, Do springboard divers violate angular momentum conservation? *Am J Phys.* 47, 1979
2. Hanavan EP, A mathematical model of the human body. AMRL TR, 1964



## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Influence of gradient and speed on energy cost of locomotion in ski mountaineering

**Authors:** Praz C<sup>1,2</sup>, Clouet T<sup>3</sup>, Léger B<sup>2</sup>, Aminian K<sup>3</sup>, Fasel B<sup>3</sup>, Kayser B<sup>1</sup>

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<sup>3</sup> Laboratory of Movement Analysis and Measurement, EPFL, Switzerland

### Abstract:

#### Introduction:

The aims of this study were to examine how slope and speed influence the energy cost of locomotion (EC) and some biomechanical variables like stride frequency, stride length, push-off duration in ski mountaineering, and to determine the optimal gradient of path and the optimal speed to minimize EC in this sport.

#### Methods:

Nine experienced ski mountaineering athletes participated (36±8 years, 176±5 cm, 70±10 kg, 15±7% of fat mass and 63±7 mlO<sub>2</sub>\*kg<sup>-1</sup>\*min<sup>-1</sup>). On snow, the skiers were equipped with their own ski mountaineering gear, a portable gas analyser (Metamax, Cortex, Germany), 2 tri-axial accelerometer/gyroscopes (Physilog, Switzerland; 1 per ski) attached on the skis just in front of the boot, and a heart rate watch (Suunto, Finland). They ascended at three slopes (12, 23 and 42%) at moderate intensity (~80% of maximal HR (HR<sub>max</sub>)). They repeated the 23% slope twice, at ~90% HR<sub>max</sub> and ~100% HR<sub>max</sub>. Trials lasted between 4 and 8 min. Gas exchange was measured over the last minutes of each ascent, to calculate EC from oxygen uptake, while the accelerometer/gyroscopes allowed the determination of speed, stride duration, stride length and duration of push-off phase.

#### Results:

Speed and stride length decreased linearly with slope. Push-off duration and stride duration increased with slope: the difference was larger between the 23 and 42% than between the 12 and 23% slopes (exponential relationship). Similarly, EC increased exponentially with slope from 12 to 42%. EC varied little with speed, slightly decreasing with increasing speeds in a logarithmical fashion (7.63, 7.49 and 7.42 J\*kg<sup>-1</sup>\*m<sup>-1</sup>).

#### Discussion/Conclusion:

The results indicate that ski mountaineering is more economical at higher speeds and a 23% incline. It remains to be investigated how this translates into competitive tactical choices of incline, speed and sustainable vertical speeds.

#### References:

1. Tosi P, Leonardi A, Schena F. The energy cost of ski mountaineering: effects of speed and ankle loading. J Sports Med Phys Fitness 2009 Mar;49(1):25-9.
2. Tosi P, Leonardi A, Zerbini L, Rosponi A, Schena F. Energy cost and efficiency of ski mountaineering. A laboratory study. J Sports Med Phys Fitness 2010 Dec;50(4):400-6.
3. Duc S, Cassirame J, Durand F. Physiology of ski mountaineering racing. Int J Sports Med 2011 Nov;32(11):856-63.

**Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg**

**Title:**

Wii Fit™ balance board exercises versus physical therapy in the treatment of acute ankle sprain patients: a randomised clinical trial.

**Authors:** I. Punt<sup>1,2</sup>, J.L. Ziltener<sup>2</sup>, D. Monnin<sup>2</sup>, L. Allet<sup>1,2</sup>

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**Abstract:**

**Introduction:**

Lateral ankle sprain is the most common sport related injury, representing approximately 15% of all sport injuries (Hootman, Dick, & Agel, 2007). In the acute phase, ankle sprains patients experience pain, loss of function and are unable to perform (full) work activities (Ivins, 2006). Standard treatment of acute ankle sprain patients consists of rest, ice, compression and elevation to reduce pain and swelling, followed by functional exercise therapy (Kerkhoffs et al., 2012; Petersen et al., 2013). Exercising at home using specific video games might be an interesting alternative in the treatment of ankle sprain patients. According to a study conducted with total knee replacement patients, potential advantages of a treatment using video games compared to conventional therapy could be reduced health care costs, improved adherence and more fun for the patient (Fung, Ho, Shaffer, Chung, & Gomez, 2012). Previous studies already demonstrated that the balance exercises of the Wii Fit™ were effective to address balance problems (Fung, et al., 2012). Balance training is an important aspect in the treatment of ankle sprains, in order to lower the occurrence of functional instability. Therefore, the use of the Wii Fit™ in this specific patient group might be a valuable alternative or complement treatment to conventional physical therapy. To our best knowledge, there are no randomized controlled trials that investigated the effectiveness of the Wii Fit™ in acute ankle sprain patients compared to current practice. The present randomized clinical trial has two objectives: (1) to compare the efficacy of exercise training with the Nintendo Wii Fit™ with conventional physical therapy in acute lateral ankle sprain patients; and (2) to compare these two types of exercise therapy to a control group who did not receive any treatment. We hypothesize that patients using the Wii Fit™ have a comparable physical function score (measured with the foot and ankle ability measure (FAAM)) and pain level, as well as a comparable delay in return to work and sport activities as patients who received physical therapy.

**Methods:**

Acute lateral ankle sprain patients (grade I or II), aged from 18 to 64 years, were included. The ankle sprain patients were discharged from the emergency department after the physician provided standard instructions regarding rest, ice, compression, and elevation and pain free movement during four weeks. In addition, patients received a semi-rigid Aircast ankle brace during this four week period. After this four week period patients underwent a baseline measure and were thereafter randomly allocated to one of the three groups: (1) exercise training with the Nintendo WII Fit™ (1 instruction and the individual training at home during 6 weeks), (2) conventional physical therapy (nine 30 minute sessions scheduled during 6 weeks) or (3) no exercise therapy (control group). Patients underwent a second evaluation to evaluate the effect of the different treatments 6 weeks after the baseline evaluation. Patients filled in the FAAM questionnaire (Martin, Irrgang, Burdett, Conti, & Van Swearingen, 2005) at both evaluations, which consists of an activities of daily living (ADL) subscale and a sports related subscale (both ranging from 0 – 100%). In addition, the 10 centimeter Visual Analogue Scale (VAS) was used to measure pain during rest and walking at baseline and at six weeks follow-up, and patients were asked if and how many days they needed to recover from the ankle sprain to return to work and sport (in days). Repeated-measure ANOVAs were performed using SPSS 18 (SPSS Inc., Chicago, USA). P-values ≤0.050 were considered statistically significant.

### Results:

Sixty-eight patients met the inclusion criteria and were randomized in one of the three arms. Twenty-two patients were randomized to the Wii Fit™ group, 21 patients to the conventional physical therapy group and 25 patients to the control group. Nineteen patients (86%) of the Wii Fit™ group, 20 patients (95%) of the physical therapy group and 17 patients (68%) of the control group completed the 6 week follow up.

FAAM questionnaire Between group differences showed that there were no differences at baseline between the three groups (all  $P>0.050$ ). Patients in all three groups demonstrated an improvement during 6 week follow-up in both subscales of the FAAM questionnaire ( $P<0.03$ ).

Although no inter group differences could be detected ( $P>0.05$ ), the Wii Fit™ group showed better FAAM scores compared to the conventional physical therapy group for ADL ( $P=0.024$ ,  $95.0\pm 6.0\%$  and  $83.5\pm 21.9\%$  respectively) and sport subscale ( $P=0.044$ ,  $79.8\pm 19.9\%$  and  $63.4\pm 27.9\%$  respectively) in the second evaluation.

VAS pain score Between group differences showed that there were no differences in pain scores at baseline (all  $P>0.050$ ). Patients in all three groups experiences a decreased pain score during walking ( $P<0.03$ ), even if no inter group difference could be detected. In addition, none of the groups showed an improvement of the VAS score during rest ( $P>0.05$ ).

Time to return to work and sport In the Wii Fit™ group 15 out of 19 patients (79%) worked and 15 patients (79%) played sport, in the physical therapy group 17 out of 20 (85%) worked and 16 (80%) patients played sport, and in the control group 12 out of 17 (71%) worked and 14 (82%) patients respectively played sport. During the second evaluation all patients returned to work, while 3 patients in the Wii Fit™ group and 3 patients in the conventional physical therapy group did not return to sport. In the Wii Fit™ group, the mean delay to return to work was 9 days (range 0-54) and the delay to return to sport 39 days (range 5-70). In the conventional physical therapy group the mean delay to return to work was 9 days (range 0-30) and to return to sport 26 days (range 0-75). In the control group the mean delay to return to work was 3 days (range 0-15) and to return to sport 23 days (range 0-60). No statistical difference in delay to return to work or sport was found between the three groups (all  $P>0.05$ ).

### Discussion/Conclusion:

All three groups of acute ankle sprain patients showed six weeks after the baseline measure an improvement in the ADL and sport FAAM subscales scores, and VAS pain score during walking. However, the Wii Fit™ group showed significant higher FAAM scores at 6-weeks follow-up compared to the physical therapy group. No improvement in VAS score during rest was found, probably due to the low scores during the baseline measure. No statistical difference was found between the three groups with regard to returned to work and sport. Nevertheless the tendency of a quicker return to work in the control group (3 days versus 9 days in the two other groups) might be of societal relevance due to reduced health care and absence of work costs. It might be important to subdivide the analyses depending on the type of work and the work related ankle load to determine its influence. Another important aspect to consider in future studies is the risk of re-injury which is with the current standard treatment up to 34% (van Rijn et al., 2008). In agreement with previous studies who showed that the Wii Fit™ is an effective treatment instrument in stroke, Parkinson, cerebral palsy, total knee replacement and obese patients (Fung, et al., 2012), we suggest that the Wii Fit™ has potential for use in the treatment of acute ankle sprain patients. However, longer follow-up studies are necessary in order to study if the use of video games might have a positive influence on recurrent ankle sprain.

(ABSTRACT TRUNCATED)

**Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg****Title:**

Comparison of Different Methods Assessing Rating of Perceived Exertion After Endurance Training

**Authors:** Roos L<sup>1,2</sup>, Tuch C<sup>3</sup>, Wyss T<sup>1</sup>.<sup>1</sup>Swiss Federal Institute of Sport Magglingen SFISM, Switzerland;<sup>2</sup>University of Fribourg, Department of Medicine, Movement and Sport Science, Fribourg, Switzerland;<sup>3</sup>Friedrich Schiller University Jena, Faculty of Social and Behavioral Sciences, Institute of Sport Science, Jena, Germany**Abstract:****Introduction:**

Monitoring training is important for coaches and athletes to optimize training regulation (Roos, Taube, Brandt, Heyer, & Wyss, 2013). With commercially available measurement devices, such as sport watches and heart rate (HR) monitors, some training parameters can be assessed objectively (e.g. duration, HR, speed). Some researchers proposed the combination of the duration of training and the corresponding HR as a mean to assess training load (TL) objectively (Borresen & Lambert, 2009). Edwards (1993) suggested the following computation: Five HR intensity zones, starting with factor 1 corresponding to 50-60% HRmax and ending with factor 5 corresponding to 90-100% HRmax. The duration in minutes in each HR zone is multiplied with its factor (1-5) and then summed in order to obtain the TL. Foster and colleagues (1996) proposed a similar subjective approach to measure perceived TL. Thereby, the duration of the training is multiplied with the value from the rating of perceived exertion (RPE) scale (Borg, 1982; Foster et al., 1996). This results in an overall session rating (sRPE) of the training session (TS). Due to its good feasibility and validity, sRPE is an extensively used method for monitoring training today (Roos et al., 2013). However, no study investigated the influence of the method to record RPE after endurance training on its validity so far. The choice of methods to assess subjective feedback is various: paper-pencil, online questionnaire but also mobile devices, such as smartphones. Thus, the purpose of this study was the identification of the most feasible and valid methods to assess sRPE after endurance training.

**Methods:**

A total of 45 endurance athletes participated in this study. The subjects received oral and written information and gave informed consent, as approved by the ethical commission of the Friedrich Schiller University Jena, before starting with the data collection. All athletes were normal to well trained and performed running endurance TS several times a week (Table 1) and participated in competitions currently or in the past.

Table 1

*Characteristics of participating athletes*

	Paper-Pencil Questionnaire	Online Questionnaire	PRO-Diary
Gender [male/female]	10/5	10/5	10/5
Age [years]	26.73 ± 5.75	27.20 ± 9.29	26.73 ± 7.87
Training sessions per week	4.54 ± 2.33	4.27 ± 2.34	4.42 ± 2.25
Hours of training per week	4.60 ± 2.82	4.80 ± 3.14	4.84 ± 2.89
Running experience [years]	7.80 ± 5.34	7.47 ± 5.54	7.31 ± 4.75

Notes. Numbers are mean ± standard deviation.

The athletes were matched according to gender, age, height, weight and fitness level into groups of three. Afterwards, they were randomly assigned to one of three methods: paper-pencil questionnaire (PP), online questionnaire (OQ) or mobile device (PRO-Diary, CamNtech Ltd., Cambridge, UK). Each athlete recorded 20 TS. No specifications on training content or duration were given, other than wearing the issued HR monitor (Suunto Memory Belt, Vantaa, Finland) during each TS. This HR monitor recorded data concealed, without displaying it on a sports watch. Therefore, the athletes were unaware of their current HR during the workout. Based on HR data, the training impulse (TRIMP) according to Edwards (1993) was calculated for each TS. Thirty minutes after each TS the athletes had to answer the question "How hard was your training today?" on the RPE scale, either on PP, OQ or the PRO-Diary. To compute the sRPE, the duration of each TS was multiplied with its corresponding RPE value. Additionally, kind of training (intermittent, long, continuous or uphill runs)

was assessed. After the 20 TS the participants answered a questionnaire about the usability and feasibility of the used method to report sRPE and rated the applied method. After testing for normal distribution, the group differences were investigated using a Oneway ANOVA with the LSD post-hoc test. The individual correlations between sRPE and the TRIMP were computed with Pearson correlations. To investigate the influence of different variables on the correlation between sRPE and TRIMP, a multiple linear regression (MLR) was computed. To avoid multi-collinearity in the MLR, none of the included variables correlated greater than  $r=0.50$ . Variables were stratified into 3-5 groups. In the analysis included were the variables: assessment method, gender, age, running experience, hours of training per week, number of interval TS, well-being, time of sRPE documentation, subjective evaluation of assessment method. Level of significance was set at  $\alpha=0.05$ . All statistical analyses were performed using SPSS 21 (IBM SPSS Statistics, IBM Corporation, Armonk, New York).

**Results:**

No differences between age, TS and hours of training per week or running experience of the participants in each study group was found. The average correlation between sRPE and TRIMP in the PP group was (mean  $\pm$  standard deviation)  $r=0.62 \pm 0.29$ . The results in the OQ group showed an average correlation of  $r=0.80 \pm 0.10$  between the sRPE and HR based method. Finally, the PRO-Diary group resulted in a correlation of  $r=0.80 \pm 0.19$ . The correlation values in the PP group were significantly lower than in the OQ ( $p=0.02$ ) and PRO-Diary ( $p=0.02$ ) groups. The MLR revealed four independent variables, which explained 38% of variance of the correlation between sRPE and TRIMP (Table 2). These variables were: number of interval TS, time lag of sRPE documentation and affiliation to OQ or PRO-Diary group.

Table 2  
*Multiple linear regression analysis: Influence on correlation between sRPE and TRIMP*

	Regression coefficient	Standard error	Beta	T	P
Number of interval TS	-0.043	0.013	-0.433	-3.315	0.002
Delayed sRPE documentation	0.443	0.190	0.303	2.335	0.025
OQ group	0.154	0.069	0.337	2.240	0.031
PRO-Diary group	0.183	0.067	0.401	2.724	0.010

*Notes.* sRPE=session rating of perceived exertion; TRIMP=training impulse; TS=training session; OQ=online questionnaire.

The more interval TS were performed, the worse the correlation between sRPE and HR based method. The affiliation to either OQ or PRO-Diary group positively influenced the correlation value between the subjective and objective TL assessment. Further, the longer the period of time between the cessation of TS and the RPE assessment on the same day, the better the sRPE and TRIMP correlated. For 11% of individuals the correlation between RPE and TRIMP data was not significant ( $r=0.31 \pm 0.25$ ), while for all the other participants a mean correlation of  $r=0.79 \pm 0.14$  was registered. Almost two thirds (60%) of the participants in PP and PRO-Diary group recommended their method for subjective TL assessment, on the contrary, only 40% in the OQ group did. However, these differences were not statistically different. Further, the required time to answer the questionnaire did not differ between methods.

(ABSTRACT TRUNCATED)

## 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Reliability of testing method for range of motion in stability boots

**Authors:** Roost J<sup>1</sup>, Bürgi S<sup>1</sup>, Hitz M<sup>1</sup>, Schwilch P<sup>1</sup>, Lorenzetti S<sup>1</sup>.

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### Abstract:

#### Introduction:

Complete ligament healing after serious ankle ligament injuries can only be achieved when the structures around the joint are protected from overstress. Stability boots stabilize ankle and ligaments while the patient's mobilization is still ensured (Müller, 1996).

The purpose of this study was to develop a fast testing method for the determination of the range of motion (ROM) in the ankle joint for loading corresponding to level gait while using stability boots.

#### Methods:

An instrumented measurement device was developed to determine the ROM in the ankle joint with stability boots. Thereby the joint was represented by a ball joint connecting the wooden foot and shank components. The shank was rotated motor-driven until a given maximum moment, controlled by the current, was reached. At this point the deflection angle was recorded. The method considered bodyweight by applying vertical force of 700 N to the sole. Furthermore the pressure induced to the foot by the lacing was controlled with a balloon pressure sensor while the shoe was tied.

Plantarflexion, dorsalexension, inversion and eversion were performed five times each with six different stability boots. Considering the measurement device, the difference between the four movements was either the rotational direction or the orientation of the boot. The chosen loading was consistent to human gait. The reliability of the presented method was assessed by determination of the intra class correlation coefficient ICC with SPSS. Additionally, the change in the mean and typical error according to Hopkins (2000) were identified.

#### Results:

In total, 24 measurement series consisting of five measurements each were evaluated. The means of the five measurements ranged from 3.4° to 24.6°, while the difference from the highest to the lowest value within one measurement series never exceeded 1.5°. For these measured angles a very high test-retest ICC value of 0.99 (95% confidence interval bounds) was found.

The small values of the change in the mean (-0.01, -0.01, 0 and 0) show excellent agreement among the trials with a typical error of 2%.

#### Discussion/Conclusion:

Our findings indicate that the fast testing method can quantify the ankle joint's ROM in stability boots with good reproducibility. Therefore, it is an appropriate method to measure differences between various models of stability boots as well as competing products. Further it can be applied to evaluate modifications and prototypes during renewal and innovation processes.

This study is part of the KTI founded project with Künzli AG.

#### References:

- Müller, C.C., Hintermann B. (1996). The stabilization effect of ankle braces. *Sportverletzungen und Sportschaden*, 10, 84-87
- Hopkins, W.G. (2000). Measures of reliability in sports medicine and science. *Sports Medicine*, 30(1), 1-15

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Football injuries in children: Epidemiological data from organized football in the Czech Republic and Switzerland

**Authors:** Rössler R<sup>1</sup>, Junge A<sup>2,3,4</sup>, Chomiak J<sup>5</sup>, Faude O<sup>1</sup>

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### Abstract:

#### Introduction:

Playing football can induce beneficial health effects, but entails also risk of injury. Such adverse events may discourage children from playing football or may lead anxious parents to forbid their children to play football as their safety may be compromised. Therefore, it seems necessary to implement preventive measures to early counteract potential injury risks and, thus, to consequently support the health benefits associated with playing football. In a first step it is necessary to assess sound epidemiological data on the characteristics of football injuries in children (Fuller, 2007; van Mechelen, Hlobil, & Kemper, 1992). Whereas numerous scientific studies on football injury of adult and adolescents have been published, (Giza & Micheli 2005; Junge & Dvorak 2004) comprehensive data concerning children under 13 years of age are nearly completely missing so far (Faude, Rössler, & Junge, 2013). A recent review on football injuries in children and adolescent players reported that incidences vary from 0.2 to 47.2 injuries per 1000 hours of football exposure in football players under the age of 19 years (Faude et al., 2013). These heterogeneous data may mostly be attributed to methodological differences between studies (e. g. observation period, data collection procedures, level of play, indoor vs. outdoor). The aim of the present study was to analyse the incidence and characteristics of football injuries in children aged between 7 and 12 years. These results will serve as a basis to develop effective injury prevention programmes.

#### Methods:

The present survey is a prospective observational cohort study on football injuries over one season in the Czech Republic and Switzerland. In each participating club a contact person was selected for each team (commonly the coaches) and asked to report exposure during training and match play and absence of players using a specially developed internet-based injury registration system. In case of an injury, coaches were required to report further information on the circumstances of the injury. In cases of open questions (e.g. details of the underlying injury mechanism, time of absence from sports participation and medical diagnosis), parents and children were contacted via telephone. An injury was defined as any physical complaint sustained by a child during a scheduled training session or match play resulting in (a) the inability to complete the current match or training session, and/or (b) the absence from subsequent training sessions or matches, and/or (c) the injury requiring medical attention (Emery & Meeuwisse, 2006; Emery, Meeuwisse, & Hartmann, 2005). Type, location and severity of injuries were classified according to an established consensus (Fuller et al., 2006). Injury characteristics are presented as absolute numbers as well as injury incidences (injuries per 1000 hours of football exposure). Results are presented for all players and if appropriate for each age category (under-13, under-11 and under-9) separately.

#### Results:

247 teams with a total of 3890 players (mean age 10.3 years, SD 1.9) took part in the study. During the documented 216,430 hours of training and 29,109 hours of match play 257 injuries occurred. Almost half (48%) were classified as minor (absence less than 8 days), 27% as moderate (absence 8 to 28 days), and 25% severe (absence more than 28 days). Overall the incidence of injury was 0.6 per 1000 hours (95%CI 0.5, 0.7) during training and 4.6 (95%CI 3.9, 5.4) during match play.

The incidences of training and of match injuries were lowest in players aged 7 or 8 years (0.3, 95%CI 0.2, 0.5 resp. 3.1, 95%CI 2.0, 4.9), higher in 9/10 year old players (0.4, 95%CI 0.3, 0.6 resp. 3.7, 95%CI 2.7, 5.2), and again higher in the 11/12 age categories (0.9, 95%CI 0.7, 1.1 resp. 5.9, 95%CI 4.7, 7.4). More than half (56%) of the injuries were caused by contact (e.g. foul play, tackling, collision, header duel, or ball contact), 31% occurred without any contact (e.g. running, jumping) and 13% were due to overuse. 137 (53%) injuries led to medical consultation. The most frequently injured body parts were ankle (22%), thigh (19%), knee (17%), upper limbs/hands (14%), and foot/toe (13%). 15 (6%) head injuries (including 3 concussions) were reported. Almost a quarter (23%) of the injuries affected the upper body. The most frequent types of injuries were 27% joint (non-bone) and ligament injuries, 26% contusions, 23% muscle and tendon injuries and 15% fractures and bone stress. Of all severe injuries (N = 65), 45% were fractures and 31% were joint and ligament injuries.

#### **Discussion/Conclusion:**

This is the first prospective large-scale epidemiological study on football players younger than 13 years. The results show that injury types in children's football differ from adolescent players in some aspects. In general, the recorded injury incidences were lower than in older players. The observation that injury incidence rates decrease with age in adolescents (Faude et al., 2013) was confirmed for the youngest players. In the present study on children the frequency of fractures/bone stress (15%) and of injuries to the upper extremity (14.0%) was higher than in adolescent players older than 13 years (about 4% and 7%, respectively) (Faude et al., 2013). Most injuries (86%) occurred in high-intensity situations with high biomechanical loads (e.g. tackling, falls, jumping/landing, or change in direction of movement). Based on this finding injury prevention programmes should include specific exercises to prepare children's musculoskeletal system for these football-specific demands. Furthermore, to reduce fall-related injuries (especially fractures of the upper limbs/hands) falling techniques should be part of injury prevention programmes for children. Because the injury rate increases with age, injury prevention should be implemented in the youngest age groups. Children should be the center of all efforts to reduce sports injuries (Emery, Hagel, & Morrongiello, 2006). The present study provides important findings on football injuries in players younger than 13 years, and thus, the evidence base for the development of a target-aimed and effective injury-prevention programme. Such an injury prevention programme was developed based on the established FIFA 11+ (Bizzini, Junge, & Dvorak, 2013), is currently pilot tested, and will be evaluated in a RCT in near future.

#### **References:**

- Bizzini, M., Junge, A., & Dvorak, J. (2013). Implementation of the FIFA 11+football warm up program: How to approach and convince the Football associations to invest in prevention. *Br J Sports Med*, 47(12), 803-806. doi: 10.1136/bjsports-2012-092124
- Emery, C. A., Hagel, B., & Morrongiello, B. A. (2006). Injury prevention in child and adolescent sport: whoseresponsibilityisit? *ClinJSportMed*, 16(6), 514-521. doi: 10.1097/01.jsm.0000251179.90840.58
- Emery, C. A., & Meeuwisse, W. H. (2006). Risk factors for injury in indoor compared with outdoor adolescent soccer. *Am J Sports Med*, 34(10), 1636-1642. doi: 0363546506288018 [pii] 10.1177/0363546506288018
- Emery, C. A., Meeuwisse, W. H., & Hartmann, S. E. (2005). Evaluation of risk factors for injury in adolescent soccer: implementation and validation of an injury surveillance system. *Am J Sports Med*, 33(12), 1882-1891. doi: 0363546505279576 [pii] 10.1177/0363546505279576
- Faude, O., Rößler, R., & Junge, A. (2013). Football Injuries in Children and Adolescent Players: Are There Clues for Prevention? *Sports Med*. doi: 10.1007/s40279-013-0061-x
- Fuller, C. W. (2007). Managing the risk of injury in sport. *Clin J Sport Med*, 17(3), 182-187. doi: 10.1097/JSM.0b013e31805930b0
- (ABSTRACT TRUNCATED)



## 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Are core strength and spine flexibility predictors of shoulder and back pain in adolescent volleyball players?

### Authors:

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

### Abstract:

**Introduction:** Volleyball is a common leisure time and competition team sport. In overhead sports like volleyball high repetitions of similar movements are responsible that shoulder and back pain can often be found in adult players (Seminati, Minetti, 2013; Bahr, Reeser, 2003). Especially in adolescent athletes intensive training sessions with unilateral loads may lead to overload injuries and pain caused by this particular type of stress. Volleyball-specific technical requirements possibly find their expression in physical and functional adaptations. The flexibility of the spine as well as strength of the arm rotators or core muscles may contribute to a risk profile in maturing volleyball players. Therefore, we aimed at evaluating possible factors and predictors of shoulder or back pain.

**Methods:** Sixty-two youth volleyball players of an advanced regional level (female: N = 34; age 16.1 (SD 2.2) y; weight 62.3 (8.7) kg; height 1.71 (0.07) m; male: N = 28; age 16.0 (1.9) y; weight 69.5 (11.8) kg; height 1.83 (0.10) m) completed retrospectively a questionnaire about the prevalence of shoulder and back pain during the last 4 years. Duration and intensity (VAS 0 – 10) of pain as well as playing level (league), weekly exposure time, and years of volleyball-specific training was recorded. Additionally spinal flexibility in flexion, extension, upright stand with arms in neutral position and 180° anteversion was measured with the spinal mouse (Idiag AG, Fehraltorf, Schweiz). Smashing ball speed was captured with a speed radar gun (Bushnell Speedster II, Kansas, USA). Isometric strength of internal and external rotation of the shoulder (both sides), isometric trunk strength in flexion and extension and core endurance strength (reps/min, Russian twist with additional load) was quantified.

**Results:** The prevalence of back pain in male players (64% [95% CI 46; 82]) was lower than in female players (82% [69; 95]) where especially the under 16 year old players (86% [71; 100]) report on back pain. Male (57% [39; 75]) and female players (53% [37; 69]) reported the same prevalence of shoulder pain with the over 16 year old females suffering more from shoulder pain (77% [55; 99]). For back pain neither performance ( $p > 0.31$ , Cohen's  $d < 0.26$ ) nor any other parameter differed between the groups with or without pain. For shoulder pain the pain group showed significant lower values in Russian twist ( $p = 0.004$ ,  $d = 0.78$ ), but higher in weight ( $p = 0.02$ ,  $d = 0.67$ ), height ( $p = 0.02$ ,  $d = 0.59$ ) and age ( $p = 0.01$ ,  $d = 0.61$ ). In various parameters of spine flexibility (e.g. lumbar position in upright standing,  $p = 0.04$ ,  $d = 0.52$ ) the values were larger in the pain group compared to the no pain group.

**Discussion/Conclusion:** Although this study was conducted as a pilot study and the sample size is relatively small, relevant results can be found concerning shoulder pain but not back pain in a group of adolescent volleyball players. Shoulder pain seems to have no direct relationship to the strength of the shoulder joint. However, spine flexibility and maturation of the athlete, respectively, seem to be of greater importance.

### References:

- Bahr, R., & Reeser, J. C. (2003). Injuries Among World-Class Professional Beach Volleyball Players The Fédération Internationale de Volleyball Beach Volleyball Injury Study. *The American Journal of Sports Medicine*, 31(1), 119-125.
- Seminati, E., & Minetti, A. E. (2013). Overuse in volleyball training/practice: A review on shoulder and spine-related injuries. *European Journal of Sport Science*(ahead-of-print), 1-12.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Early attentional processes distinguish selective from global motor inhibitory control: an electrical neuroimaging study

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### Abstract:

#### Introduction:

The rapid stopping of specific parts of movements is frequently required in daily life. Yet, whether selective inhibitory control of movements is mediated by a specific neural pathway or by the combination between a global stopping of all ongoing motor activity followed by the re-initiation of task-relevant movements remains unclear. To address this question, we analyzed electrical neuroimaging responses to global vs selective inhibition stimuli presented during a Go/NoGo task.

#### Methods:

Participants had to respond as fast as possible with their two hands to Go stimuli and to withhold the response from the two hands (global inhibition conditions, GNG) or from only one hand (selective inhibition, SNG) when specific NoGo stimuli were presented.

#### Results:

Behaviorally, we replicated previous evidence for slower response times in the SNG than in the Go condition. Electrophysiologically, there were two distinct phases of event-related potentials modulations between the GNG and the SNG conditions. At 110-150ms post-stimulus onset, there was a difference in the strength of the electric field without concomitant topographic modulation, indicating the differential engagement of statistically indistinguishable configurations of neural generators for selective and global inhibitory control. At 150-200ms, there was a change in the electric field topography, indicating the engagement of distinct configurations of neural generators. Source estimations localized these effects within bilateral temporo-occipital and posterior parietal regions and within a parieto-central network, respectively.

#### Discussion/Conclusion:

Our results suggest that while both types of motor inhibitory control depend on global stopping mechanisms, selective and global inhibition still differ quantitatively at early attention-related processing phases.

**Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg**

**Title:**

Performance and physiological responses with “Live High---Train Low” in normobaric vs. hypobaric hypoxia.

**Authors:** Saugy J.<sup>1</sup>, Schmitt L.<sup>2</sup>, Cejuela R.<sup>3</sup>, Faiss R.<sup>1</sup>, Rudaz B.<sup>1</sup>, Delessert A.<sup>1</sup>, Hauser A.<sup>4</sup>, Wehrlin J.<sup>4</sup>, Millet G-P.<sup>1</sup>

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**Abstract:**

**Introduction:**

Slight physiological differences between acute exposures in normobaric (NH) vs. hypobaric (HH) hypoxia have been reported recently. However, the clinical significance of these differences is still questioned. For example, it is unknown if the performance decrement, when compared to normoxia, is similar in NH or HH. Nowadays, no study has investigated the adaptations and performance gains following NH and HH altitude training camps. Since the Live High Train Low (LHTL) method has been considered as a gold standard, various combinations of altitude training methods have emerged using intermittent exposure, combined to LHTL (Millet, Roels, Schmitt, Woors, & Richalet, 2010). Bonetti and Hopkins recently published a good meta-analysis on the “Sea-level Exercise Performance Following Adaptation to hypoxia” (Bonetti & Hopkins, 2009). But to date, the question of the effectiveness of LHTL training with simulated or terrestrial altitude is still unknown. The aim of the present study was to assess in well-trained athletes the physiological responses to LHTL training camps in NH vs HH as well as the changes in post-hypoxia endurance performance.

**Methods:**

Twenty-seven highly trained triathletes living at or near sea level (27 males, age  $23 \pm 4$  years, height  $179 \pm 5$  cm, body weight  $71 \pm 7$  kg and  $VO_{2max}$   $66.9 \pm 8.4$  ml.kg<sup>-1</sup>.min<sup>-1</sup>) participated in this study. The experimental design consisted of a lead-in period of three weeks, where the training loads were quantified and controlled, preceded by a track 3000m running test. After this lead-in period, all subjects travelled to Prémaman, France (1135m) to perform the Pre-session that included another 3000m test, a maximal incremental test on ergocycle, Hemoglobin (Hb) mass measurement (CO rebreathing method), anthropometrical measurement and blood sample. Two groups (NH, n=14 and HH; n=13) were matched on their  $VO_{2max}$  values and performed a 18-days LHTL camp where they trained at 1100---1200m while they slept either in NH (Prémaman;  $FiO_2$   $15.8 \pm 0.82\%$ , BP  $664.9 \pm 6.7$  mmHg,  $PiO_2$   $121.4 \pm 4.9$  mmHg) or in HH (Fiescheralp---Fiesch,  $FiO_2$   $20.93 \pm 0.03\%$ , BP  $579.7 \pm 23.4$  mmHg,  $PiO_2$   $121.3 \pm 4.8$  Fiescheralp, Switzerland, 2250m). During the whole sojourn, training content and training loads were monitored daily, pulse oxygen saturation (SpO<sub>2</sub>) was recorded at the finger during each night. After the LHTL camp, all subjects traveled back to Prémaman for the Post-session similar to pre-. Finally, the subjects performed two additional 3000m tests at seven (Post---7) and twenty-one (Post---21) days after the camp.

**Results:**

No difference was found at any point between NH and HH in terms of training loads during the whole training camp. The hypoxic dose was smaller in NH than HH with a daily hypoxic exposure of  $12.2 \pm 0.3$  vs.  $16.8 \pm 3.1$  h,  $P < 0.001$  and a total hypoxic exposure of  $220.1 \pm 0.9$  vs.  $302.9 \pm 5.5$ ,  $P < 0.001$  for NH and HH respectively. No difference in 3000m-performance was found between groups at Lead-in, Pre-, Post- and Post---7. However, HH improved performance to a larger extent than NH between Pre- and Post---21 and between Post---7 and Post---21 (Fig. 1). Average night SpO<sub>2</sub> was lower in HH than NH (Fig. 2).  $VO_{2max}$ ,  $P_{max}$  and Hbmass increased from Pre- to Post- on both groups (table 1). A significant decrease in [EPO] was found at Post- only in HH (table 1).

### Discussion/Conclusion:

Immediately after the LHTL camp (Post---), although VO<sub>2</sub>max, P<sub>max</sub> and Hbmass increased at Post---, the aerobic 3000m running performance was not improved. This could be explained by the fatigue induced by the high training loads during the camps. The improvement was significant in both groups only at Post---21. These results illustrates the delayed performance improvement mechanisms already described before by Burtscher et al. "Progressive cardiovascular adjustments might have contributed primarily to the time---dependent improvements observed after altitude training, possibly by an enhanced stroke volume overcompensating the reduced heart rates during submaximal exercise" (Burtscher, Nachbauer, Baumgartl, & Philadelphia, 1996; Chapman, Laymon Stickford, Lundby, & Levine, 2013). Our results are in line with Schmitt et al. who reported that VO<sub>2</sub> and the power output at the lactic threshold were significantly higher at Post---15 (Schmitt et al., 2006). The performance enhancement at Post---21 was greater for HH than NH. This could be explained by the higher solicitation of the HH camp, highlighted by the night SpO<sub>2</sub> that was lower during the whole camp in HH but was maintained lower back to lower altitude (Post---1 and 2). Savourey et al. (Savourey, Launay, Besnard, Guinet, & Travers, 2003) has already shown that HH induces different physiological responses than NH in short acute hypoxia exposure characterized by a greater respiratory frequency, a lower tidal volume and minute ventilation suggesting an increase of dead space ventilation leading to greater hypoxemia and lower SaO<sub>2</sub>, and this could explain the difference in term of arterial saturation. Although we did not measure the Hbmass at Post---21, Gore et al. (Gore et al., 2013) reported in a meta---analysis a significant increase of Hbmass values with LHTL training camps at post---20. It is important to observe that NH involves practical difficulties to reach similar exposure time/day than HH. In conclusion, the higher performance enhancement for HH at Post---21 could be explained by the larger hypoxic dose and oxygen desaturation leading to greater ventilatory and hematological improvement.

### References:

- Bonetti, D. L., & Hopkins, W. G. (2009). Sea-level exercise performance following adaptation to hypoxia: a meta-analysis. *Sports medicine*, 39(2), 107-127. doi: 10.2165/00007256-200939020-00002
- Burtscher, M., Nachbauer, W., Baumgartl, P., & Philadelphia, M. (1996). Benefits of training at moderate altitude versus sea level training in amateur runners. *European journal of applied physiology and occupational physiology*, 74(6), 558-563.
- Chapman, R. F., Laymon Stickford, A. S., Lundby, C., & Levine, B. D. (2013). Timing of Return From Altitude Training for Optimal Sea Level Performance. *J Appl Physiol* (1985). doi: 10.1152/jappphysiol.00663.2013 (ABSTRACT TRUNCATED)

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Loading conditions of the lumbar spine during unrestricted and restricted squats

**Authors:** Pascal Schütz<sup>1</sup>, Olivier Meyer<sup>1</sup>, Florian Schellenberg<sup>1</sup>, Renate List<sup>1</sup>, Silvio Lorenzetti<sup>1</sup>.

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### Abstract:

#### Introduction:

Squatting is a common strength training exercise in rehabilitation, fitness training, and in preparation for competition. Knowledge about loading and motion of the back during squat exercise is crucial to avoid overuse or injury. The kinematics of the legs, trunk, and spine (List et al., 2013) as well as the loading conditions of the knee and hip (Lorenzetti et al., 2012) during unrestricted and restricted (knees are not allowed beyond toes) squats were already described. The aim of this study was the quantification of the loading conditions of the lumbar spine during unrestricted and restricted squats.

#### Methods:

19 healthy subjects performed unrestricted and restricted squats with a barbell of 0, 25, and 50% bodyweight extra load. Subjects were asked to perform eight repetitions for each condition. Motion was recorded using a 12-camera Vicon system and ground reaction forces were measured using a force plate under each foot.

The loading conditions in the lumbar spine were calculated using anthropometric L4/L5 joint center (Gilad & Nissan, 1986) and inverse dynamics approach. The use of the back implement of our whole body "IfB-marker-set" (List et al., 2013) including 24 trunk and 7 pelvic skin markers allows to measure the sagittal curvatures of the lumbar spine. The mean maximal sagittal L4/L5 moment and mean minimal curvature of every subject in the different conditions were compared using a linear mixed model and a level of significance of  $\alpha=0.05$ .

#### Results:

The maximal sagittal L4/L5 moment was significantly larger in restricted compared to unrestricted squats ( $p=0.047$ ). No significant difference between the unrestricted and restricted squat was found for the minimal curvature of the lumbar spine.

#### Discussion/Conclusion:

The goal of barbell squats is to strengthen the muscles of the lower limbs. To avoid high loading of the lower back the unrestricted squat should be chosen. These findings support the results of earlier studies to not be overly strict in coaching against anterior knee displacement during performance of the squat (Fry, Smith, & Schilling, 2003; List et al., 2013).

#### References:

- Fry, A., Smith, J., & Schilling, B. (2003). Effect of knee position on hip and knee torques during the barbell squat. *Journal of Strength and Conditioning Research*, 17(4), 629-633.
- Gilad, I., & Nissan, M. (1986). A study of vertebra and disc geometric relations of the human cervical and lumbar spine. *Spine (Phila Pa 1976)*, 11(2), 154-157.
- List, R., Gulay, T., Stoop, M., & Lorenzetti, S. (2013). Kinematics of the trunk and the lower extremities during restricted and unrestricted squats. *J Strength Cond Res*, 27(6), 1529-1538.
- Lorenzetti, S., Gulay, T., Stoop, M., List, R., Gerber, H., Schellenberg, F., & Stussi, E. (2012). Comparison of the angles and corresponding moments in the knee and hip during restricted and unrestricted squats. *J Strength Cond Res*, 26(10), 2829-2836.

## Abstractvorlage 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg

### **Titel:**

Einfluss des Körpergewichts auf die motorische Fitness

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### **Abstract:**

#### **Einleitung:**

Die Analyse von Zusammenhängen zwischen sportmotorischer Leistung und der Gesundheit von Kindern ist eine wichtige Grundlage für die Entwicklung von effizienten Präventionsmassnahmen (Krombholz, 2006). Das Körpergewicht gilt dabei als wichtiger Indikator für ein erhöhtes Gesundheitsrisiko, da Übergewicht und Adipositas mit diversen Krankheiten assoziiert sind (Freedman & Sherry, 2009). Ziel der vorliegenden Studie war es deshalb, die Anzahl der übergewichtigen und adipösen Primarschulkinder über einen längeren Zeitraum zu erfassen, und zu untersuchen, welchen Einfluss das Gewicht auf die sportmotorische Leistung der Kinder hat.

#### **Methode:**

Im Rahmen der Sportmotorischen Bestandesaufnahme (SMBA) werden seit 2005 jährlich rund 3500 Erstklässler der Städte Zürich, Winterthur und Bülach mit den Tests Seitliches Hin- und Herspringen (KTK), Arm-Tapping (EUROFIT), Standweitsprung (EUROFIT), 20m-Sprint (AST 6-11) und Shuttle Run (EUROFIT) auf ihre sportmotorische Leistungsfähigkeit getestet. Gleichzeitig wird Gewicht und Grösse erfasst. In die vorliegende Auswertung wurden 17172 Kinder miteinbezogen, die zwischen 2005 und 2011 getestet wurden (Alter = 7.09 ± 0.37 Jahre). Die Einteilung in die jeweilige Gewichtsgruppe erfolgte mittels der Software WHO AnthroPlus.

#### **Resultate:**

2005-2011 blieb die Anzahl übergewichtiger und adipöser Primarschulkinder auf einem hohen Niveau stabil (Abb. 1). Im Gegensatz zu den Mädchen zeigte sich bei den Jungen sogar ein leicht positiver Trend im Verlauf der sieben Jahre ( $\chi^2=51.93$ ,  $p<0.01$ ). Das Körpergewicht (BMI) und die motorische Leistungsfähigkeit zeigten bei Erstklässlern keinen Zusammenhang ( $r=0.06-0.27$ ). Ausser beim Tapping zeigten sich in allen Tests hochsignifikante Unterschiede zwischen den Gewichtsgruppen, sowohl bei den Jungen als auch bei den Mädchen ( $p<0.01$ ).

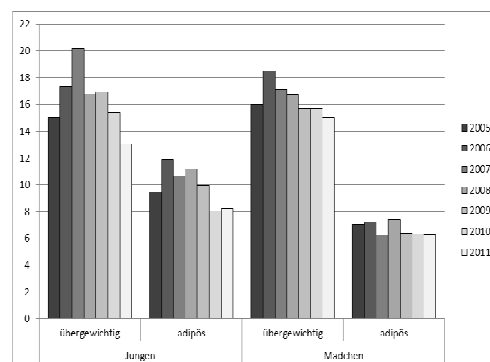


Bild 1: Übergewichtsquote über die Jahre

#### **Diskussion/Schlussfolgerung:**

Von 2005-2011 blieb die Anzahl übergewichtiger Kinder auf hohem Niveau stabil, es ist sogar eine positive Tendenz bei den Jungen erkennbar (Bild 1). Das Körpergewicht (BMI) und die motorische Leistungsfähigkeit zeigten bei Erstklässlern keinen Zusammenhang, die Leistung von adipösen und übergewichtigen Gruppen Kindern unterschied sich aber signifikant von der Gruppe der Normalgewichtigen.

#### **References:**

- Krombholz H (2006). Physical performance in relation to age, sex, birth order, social class, and sports activities of preschool children. *Percept Mot Skills*. 102: 477-484
- Freedman DS und Sherry B (2009). The validity of BMI as an indicator of body fatness and risk among children. *Pediatrics* 124 (Suppl 1): S23-34

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Lumbar trunk muscle activation during different flexion exercises

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<sup>1</sup>Movement and Sport Science, Department of Medicine, University of Fribourg, Switzerland

### Abstract:

#### Introduction:

Lumbar trunk muscle activity can be estimated by surface electromyography (sEMG) [1]. Some studies showed a more common trunk muscle activity during exercises [2], while other studies indicated a more independent activity [3]. The aim of this study was to investigate variations in the activity measured at different sides within three major trunk muscles during voluntary isometric flexion exercises.

#### Methods:

Fifteen healthy males practicing regularly sports participated in the experiment. They had to perform three different isometric trunk flexion exercises: Symmetric flexion of the upper body (SFU), asymmetric flexion of the upper body (AFU), symmetric flexion of the lower body (SFL). We measured trunk flexion force and bilateral sEMG over three major trunk muscles: rectus abdominis (RA), obliquus (OB), and erector spinea (ES). Bipolar EMG recordings were obtained from several longitudinal sides (3 to 4) over each muscle and signals were processed as described in a previous study [1]. The mean forces and sEMG amplitudes were determined during the contraction phase of the three trunk exercises. Bilateral muscular symmetry was assessed for each muscle and for each recording side within the muscles during the contraction phase. Finally, the bilateral averaged EMG amplitude of longitudinal sides was determined for RA and ES.

#### Results:

The average flexion force was  $122\pm 62\text{N}$  and was not significantly different between exercises ( $p=0.448$ ). The average EMG amplitude over RA, ES, OB ( $55\pm 15$ ,  $6\pm 3$ ,  $41\pm 11$  %-MVC, respectively) showed no significant effect between exercises for ES ( $p=0.426$ ), whereas significant differences were apparent for RA and OB ( $p<0.001$ ). Post-hoc analysis revealed a lower activity ( $>-33\%$ ) of RA/OB for the SFL exercise ( $p<0.003$ ). The bilateral symmetry showed significant differences for some recording sides for the AFU exercise ( $p<0.03$ ), whereas the SFU and SFL exercises revealed no significant effect ( $p>0.06$ ). The EMG amplitude of RA was increased by 10% for the caudal compared to the cranial extremity of SFU and AFU ( $65\pm 9$ ,  $56\pm 10$  %-MVC, respectively;  $p<0.05$ ), whereas SFL showed no significant differences ( $p=0.74$ ). The EMG amplitude of ES displayed a 4% higher activity at cranial compared to the caudal side for all exercises ( $8\pm 5$ ,  $4\pm 2$  %-MVC, respectively;  $p<0.004$ ).

#### Discussion/Conclusion:

Despite comparable flexion forces, activity of the major trunk muscles differed with respect to the exercise resulting in a 33% lower activity for RA and ES during the SFL exercise. Most likely the iliopsoas muscle contributes to the flexion in the SFL exercise. The muscle activity obtained at different longitudinal sides within a muscle revealed a bilateral difference only for the AFU exercise. More specifically, RA showed higher activity over the caudal side for SFU and AFU exercises but comparable activity at all sides during SFL. In contrast, ES showed higher activity over the cranial side for all exercises. It can be concluded that the type of flexion exercise influences the intensity how different sides within major trunk muscles are activated.

#### References:

1. Staudenmann D, Effects of EMG processing on biomechanical models of muscle joint systems: sensitivity of trunk muscle moments, spinal forces, and stability. *J Biomech* 40, 2007
2. Cholewicki J, All abdominal muscles must be considered when evaluating the intra-abdominal pressure contribution to trunk extensor moment and spinal loading. *J Biomech* 37, 2004
3. Hodges PW, Feedforward contraction of transversus abdominis is not influenced by the direction of arm movement. *Exp Brain Res* 114, 1997

**Abstractvorlage 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg**

**Titel:**

Leistungsunterschiede innerhalb der Klasse bei Schweizer Erstklässlern: Sind ältere Kinder besser?

**Autoren:** Tomatis L<sup>1</sup>, Krebs A<sup>1</sup>, Siegenthaler J<sup>1</sup>, Murer K<sup>1</sup>.

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**Abstract:**

**Einleitung:**

Als Basis für zielgerichtete Interventionen ist eine verlässliche Diagnose nötig. Mit motorischen Tests kann die motorische Leistungsfähigkeit erfasst und beobachtet werden (Bös 2009). In der Schweiz wurde dazu die Testbatterie der Sportmotorischen Bestandesaufnahme (SMBA) entwickelt, die speziell die Situation im Schulumfeld berücksichtigt. Ziele sind die Beobachtung von säkularen Trends bei Schweizer Erstklässlern sowie die differenzierte Betrachtung von altersabhängigen Leistungsunterschieden innerhalb eines Schuljahrgangs.

**Methode:**

Die SMBA-Testbatterie besteht aus fünf international gebräuchlichen Tests (20m-Sprint (AST 6-11), Seitliches Hin- und Herspringen (KTK), Arm-Tapping, Standweitsprung, 20m Shuttle-Run (EUROFIT)). Zusätzlich wird Grösse und Gewicht erfasst. Die Daten werden in Altersgruppen geteilt und Mittelwert und Standardabweichung werden berechnet. Perzentil Kurven (5, 25, 50, 75 und 95 Perzentile) für Grösse, Gewicht, Body Mass Index und die Fitnesstests wurden mittels Generalized Additive Models for Location, Scale and Shape (Rigby und Stasinopoulos, 2004) berechnet. Die SMBA findet in Zürich seit 2005 jährlich statt, so dass Daten von 20'708 Kindern vorliegen.

**Resultate:**

Über die Jahre konnten nur leichte Leistungsschwankungen beobachtet werden: 0.08s im 20m-Sprint, 1s im Tapping, 1.6cm im Standweitsprung, 1.7 Sprünge im seitlichen Hin- und Herspringen und 3.9 Längen im Shuttle Run (siehe Tab. 1.).

Tab. 1. Resultate in der 1 Klassen (2005-2012). Angegeben sind Mittelwerte (Standardabweichungen)

Schuljahr	2005-2006 (N=2268)	2006-2007 (N=2346)	2007-2008 (N=3335)	2008-2009 (N=3284)	2009-2010 (N=3437)	2010-2011 (N=3356)	2011-2012 (N=2682)
20m-Sprint (s)	4.61 (0.36)	4.58 (0.36)	4.65 (0.37)	4.63 (0.37)	4.61 (0.37)	4.61 (0.36)	4.66 (0.37)
Arm-Tapping (s)	22.8 (3.8)	22.7 (3.7)	22.7 (3.8)	22.4 (3.8)	22.2 (3.6)	23.2 (3.8)	22.4 (4.4)
Standweitsprung (cm)			109.7 (17.3)	109.7 (17.6)	109.3 (17.8)	111.5 (17.7)	110.6 (16.9)
Seitliches Springen (n)	25.8 (5.3)	24.8 (5.4)	25.3 (5.4)	24.1 (5.5)	25.0 (5.4)	25.1 (5.4)	24.2 (5.2)
20m Shuttle-Run (n)	30.6 (13.3)	33.0 (13.0)	30.3 (13.4)	30.8 (13.2)	31.5 (14.1)	31.9 (14.5)	34.2 (14.1)

Perzentil Kurven werden dargestellt. Bewertet man die Kinder in der ersten Primarschulklasse (7.16±0.42 Jahre alt) mit altersbezogenen Normwerten, schneiden die Jüngeren gut, die Älteren in der Klasse schlecht ab.

**Diskussion/Schlussfolgerung:**

Normwerte für den Schulbetrieb sollten im Schulumfeld generiert werden. Insbesondere ist zu beachten, dass die Kinder häufig nicht altersgerechte, sondern klassenstufengerechte Leistungen erbringen. Offenbar haben die Kinder die Tendenz, sich dem Klassenniveau anzupassen, was sich auch bei Repetenten zeigt. Die Leistungen blieben 2005-2012 konstant.

**Literatur:**

Bös, K, Worth, A, Opper, E, Oberger, J, Romahn, N, Wagner, M, et al. (2009). Motorik-Modul. Baden-Baden: Nomos (Deutschland).

Rigby, RA, Stasinopoulos, DM (2004). Smooth centile curves for skew and kurtotic data modelled using the Box-Cox power exponential distribution. Statistics in Medicine, 23(19), 3053-3076.



## Abstractvorlage 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg

### Title:

Sportspielspezifisches Verhalten in typischen Entscheidungssituationen

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### Abstract:

#### Introduction:

Das Recognition-Primed-Decision-Making-Modell formuliert zutreffend das Verhalten in ökologischen Entscheidungssituationen (Klein, 2008). Für das Sportspiel wird das Modell angepasst. Das Modell taktischer Entscheidungen im Sportspiel beschreibt das Verhalten in kurzfristigen und schnell wechselnden Entscheidungssituationen (TEISS: Weigel, i. Dr.). Der Entscheidungsprozess unterteilt sich drei kognitive, voneinander abhängige Phasen: Informationsaufnahme, Situationsklassifizierung, mentale Simulation. Der Vorteil des TEISS-Modells liegt in der Annahme, dass nicht verschiedene Handlungsalternativen miteinander verglichen werden. Die Erfolg versprechende Handlung wird ausgeführt, auch wenn diese nicht zwingend die optimale Alternative darstellt.

#### Methods:

Jugendlichen Handballspielern der obersten Leistungsklasse (Landesauswahl;  $n = 9$ ) und der untersten Leistungsklasse (Bezirksliga;  $n = 9$ ) werden eine Vielzahl von offensiven Handballsituationen präsentiert (Studie 1: abstrakt dargestellt; Studie 2: komplex dargestellt). Beide Experimente werden auf dem vertikalen Kontinuum der multiplen Aufgabenreihen angeordnet (Roth, 1996). In diesen sollen sich die Probanden gedanklich in einen vorgegebenen Feldspieler hineinversetzen und hinsichtlich des Torerfolgs handeln. Mit einer Eye-Tracking-Kamera werden die Blickbewegungen erfasst. Im Anschluss der einzelnen Szenen skizzieren die Probanden die zuletzt wahrgenommene Konstellation.

#### Results:

Beide Einzelexperimente zeigen, dass Landesauswahlspieler Abschlusshandlungen mit der höheren Erfolgswahrscheinlichkeit generieren als gleichaltrige Bezirksligaspieler (abstrakt:  $U = 14.0$ ;  $z = -2.34$ ;  $p < .01$ ;  $\Phi = .55$ ; komplex:  $U = .0$ ;  $z = -3.58$ ;  $p < .001$ ;  $\Phi = .84$ ). In den komplex dargestellten Angriffsszenen nehmen Landesauswahlspieler weniger visuelle Informationen auf als Bezirksligaspieler (Fixationsanteil:  $U = .00$ ;  $z = -3.58$ ;  $p < .001$ ;  $\Phi = .84$ ). Demgegenüber werden diese in der zur Verfügung stehenden Zeit detaillierter verarbeitet (Situationswahrnehmung:  $U = 16.0$ ;  $z = 2.165$ ;  $p = .03$ ;  $\Phi = .51$ ). Des Weiteren unterscheiden sich beide Teilstichproben innerhalb der Fixationsregionen. Während Landesauswahlspieler vorwiegend die Gegenspieler fixieren, betrachten Bezirksligaspieler die eigene Mannschaft.

#### References:

Klein, G. A. (2008). Natural Decision Making. *Human Factors*, 50, 456-460.

Roth, K. (Hrsg.). (1996). *Techniktraining im Spitzensport: Alltagstheorien erfolgreicher Trainer*. Köln: Sport und Buch Strauß.

Weigel, P. (i. Dr.). *TEISS - Taktische Entscheidungen im Sportspiel*. Schorndorf: Hofmann.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Grab Start or Track Start in Swimming?

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### Abstract:

#### Introduction:

The starting technique in swimming plays an essential role for the outcome of a competitive race, especially in short distance sprints (Cossor & Mason, 2001). The two standard starting variations are the grab start where both feet stand next to each other on the block and the track start where the feet stand in a step position comparable with running sprint starts (Krueger et al., 2002). In recent times the grab start has been gradually replaced by the track start technique. However, both techniques are still used in high level competitive swimming and the question arises which technique results in the best swimmer's performance. Furthermore, new regulations in international swimming have led to a new starting block design, the OSB11 (Biel et al., 2010). This new design could lead to a definitive start advantage using the track start, due to the additional kick plate at the rear end of the block (Kibele et al., 2011).

Therefore the aim of this study was to identify differences in starting technique between the grab start and the track start, but also to compare the traditional block design with OSB11.

#### Methods:

Seventeen swimmers (4f/13m, aged: 18.6±2.3 y) with an average experience of 9.3 years in competitive swimming participated in this study. The swimmer's performance during the start was evaluated according to a 7.5 m distance time. Furthermore, additional kinematic parameters as joint and body angles, horizontal velocities, flight distance, immersion length and times at different distances were assessed. Temporal parameters comprised the reaction time, block time and flight times. Starts were recorded with a system of four video cameras positioned sagittal of the swimmers, one above and two underwater, as well as posterior of the swimmer. All swimmers completed three starts of each of the three starting types (grab start, track start on traditional block and on OSB11) in a random order. Results were statistically analysed using a linear mixed model and possible influences and dependencies were reviewed.

#### Results:

No significant differences between the grab and the track start as well as between the traditional block and the OSB11 could be identified. However, the track start using the OSB11 block design was found to be superior to the other two techniques, as the 7.5 m time was shorter for this starting type ( $p < 0.051$ ). The block time varied strongly between the different starts, and was longest for the grab start and shortest for the track start on OSB11.

#### Discussion/Conclusion:

In conclusion, swimming track starts on the new block design (OSB11) lead to a better starting performance compared to track starts on conventional starting blocks. If the new block design is not available the individually preferred starting technique - grab or track start - should be used.

#### References:

- Biel, K., Fischer, S., & Kibele, A. (2010). *Zur Effektivität des neuen Startblocks (OSB 11) beim Schrittstart im Schwimmen*. Paper presented at the Biomechanische Leistungsdiagnostik im Schwimmen—Erfahrungen im Leistungssport und Ableitungen für die Ausbildung von Studierenden. Beiträge zum dvs-Symposium Schwimmen.
- Cossor, J., & Mason, B. (2001). *Swim start performances at the Sydney 2000 Olympic Games*. Paper presented at the Proceedings of XIX Symposium on Biomechanics in Sport.
- Kibele, A., Fischer, S., & Biel, K. (2011). Biomechanische Grundlagen des Startsprungs im Schwimmen. *Sportwissenschaft*, 41(3), 202-215.
- Krueger, T., Wick, D., Hohmann, A., El-Bahrawi, M., & Koth, A. (2002). *Biomechanics of the Grab and Track Start Technique*. Paper presented at the Biomechanics and Medicine in Swimming IX, St. Etienne.

## 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Motor skill performance during Talent Eye testing: Secular trends between 2010 and 2013

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### Abstract:

#### Introduction:

Present studies seem to confirm a secular decline in fundamental motor skills (FMS) in children [1, 2]. FMS are basic movements, which include locomotor (e.g. running and hopping), manipulative or object control (e.g. catching and throwing) and stability (e.g. balancing and twisting) skills, also called key components for further fundamental sport skills [1]. Motor performance and these skills are of considerable importance for health at all ages and had to be developed in childhood [1, 2]. Talent Eye is an integral part of talent scouting and development in the Region of Basel. The development of motor skills is an important part of the Talent Eye training which follows annually after the selection process.

The aim of this study was to define secular trends of motor skill performance during Talent Eye testing between selected and non-selected children from 2010 to 2013.

#### Methods:

We included children from the first primary classes ( $7.5 \pm 0.4$  y) of four age groups from 2010 to 2013 (2010,  $n=173$ ; 2011,  $n=120$ ; 2012,  $n=113$ ; 2013,  $n=159$ ). The children completed eight standardized and validated tests for motor skills (balancing backwards [score]; target throwing [score]; side-to-side jump [score]; sit-ups [score]; tapping [s]; sprint [s]; shuttle run [level]; standing long jump [m]). We included age [y], weight [kg] and height [m] in a formula to eliminate the Relative Age Effect. Over this period 191 children were selected and 374 were not selected. Two ("selection": non-selected, selected)  $\times$  four ("year": 2010, 2011, 2012, 2013) univariate analyses of variances were computed for each motor skill parameter.

#### Results:

Significant selection effects ( $p < 0.001$  for each parameter, partial eta squared ( $\eta_p^2$ ) between 0.07 and 0.79) were found for all motor performance parameters. Year effects were only observed for balance ( $p < 0.001$ ,  $\eta_p^2 = 0.04$ ), sit-ups ( $p < 0.001$ ,  $\eta_p^2 = 0.12$ ), tapping ( $p < 0.001$ ,  $\eta_p^2 = 0.32$ ), sprint ( $p < 0.001$ ,  $\eta_p^2 = 0.08$ ) and long-jump ( $p = 0.004$ ,  $\eta_p^2 = 0.04$ ). Post-hoc testing showed significant year-differences ( $p < 0.05$ ) for decreased balance performance (2010-13) in both groups. Similarly, significant year-differences by post-hoc testing were also shown for increased sit-ups (2011-2012) in each group. Moreover, significant results were also shown for increased (2010-2011) or decreased (2011-13) tapping and decreased sprinting (2010 to 2012, 2010 to 2013). A significant year  $\times$  selection interaction was only found for side-to-side jumping ( $p < 0.014$ ,  $\eta_p^2 = 0.02$ ). Post-hoc testing did not reveal any statistical differences.

#### Discussion/Conclusion:

The Talent Eye motor testing battery reliably distinguished between selected and not selected children in all tested parameters. Secular trends with decreasing motor performance from 2010 to 2013 regarding backwards-balancing were observed in both groups (selected: -10.2%; non-selected: -22.2%). All other motor performance parameters did not show any distinct secular trend. These results have showed a partial decrease in motor performance over this period of time and are not accompanied by the secular trends described in the literature.

#### References:

1. Lubans, D. R., Morgan, P. J., Cliff, D. P., Barnett, L. M., & Okely, A. D. (2010). Fundamental movement skills in children and adolescents: review of associated health benefits. [Review]. *Sports Med*, 40(12), 1019-1035.
2. Roth, K., Ruf, K., Obinger, M., Mauer, S., Ahnert, J., Schneider, W., Graf, C., & Hebestreit, H. (2010). Is there a secular decline in motor skills in preschool children? *Scandinavian Journal of Medicine & Science in Sports*, 20(4), 670-678.

## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Neuromuscular control mechanisms during single-leg jump landing in acute ankle sprain patients

**Authors:** Zumstein F<sup>1</sup>, Allet L<sup>2</sup>, Radlinger L<sup>3</sup>, Eichelberger P<sup>3</sup>, Punt I<sup>2</sup>

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### Abstract:

#### Introduction:

Ankle sprain injury is the most common type of acute sports trauma (Hootman, Dick, & Agel, 2007). The main mechanism causing lateral ankle sprain is an excessive and explosive inversion and plantar flexion of the rearfoot on the tibia (Fuller, 1999) during gait or during jump landing (Bullock-Saxton, Janda, & Bullock, 1994) (Hertel, 2008). Optimal neuromuscular control mechanisms are essential for preparing, maintaining and restoring functional joint stability (Riemann & Lephart, 2002) during jump landing and to prevent ankle injuries. There are two types of neuromuscular control, namely feedforward and feedback control (Riemann & Lephart, 2002)(DeMont & Lephart, 2004). Feedforward control is mainly involved in the control of the position of the foot at touchdown (DeMont & Lephart, 2004), and is particularly important for the m. tibialis anterior, m. gastrocnemius and m. peroneus longus in order to guarantee the dynamic stabilization at touchdown (Lin, Chen, & Lin, 2011). The importance of this control seems evident, when considering the time delay before any muscle activity, based on feedback control, starts. The earliest feedback control seems to occur only 30ms after touchdown (Duncan & McDonagh, 2000). These delays are associated with the reflex arc (Santello, 2005). Furthermore, Ashton-Miller, Ottaviani, Hutchinson, & Wojtys (1996) identified the critical phase for ankle sprains at 40ms after touchdown, when ground reaction force reaches the peak value after jump landing.

Knowledge of motor control mechanisms in acute ankle sprain patients is sparse. Although electromyographic (EMG) and kinematic changes before jump landing have been shown in patients with chronic ankle instabilities (CAI) by Caulfield and Garrett (2002) and Hertel (2008), the development of CAI is not thoroughly understood. In particular, studies investigating motor control mechanism during functional tasks in acute ankle sprain patients are missing. Gathering insight in motor control mechanisms during jump landing in acute sprained ankles might influence rehabilitation protocols and improve prevention strategies to reduce recurrent injuries. In addition, differences in motor control at jump landing between sprained ankles and non-sprained ankles might permit to identify parameters which facilitate the decision making about the optimal time point to return to sport activities and thus improve the clinical reasoning. Therefore, the overall aim of this study was to compare motor control mechanisms between acute ankle sprain patients and healthy subjects prior to and during the initial contact phase of a 25 centimeter single-leg jump. More specific; EMG activity of m. tibialis anterior, m. gastrocnemius lateralis and m. peroneus longus, as well as kinematic data for ankle, knee and hip were measured during the pre-initial contact phase, the post-initial contact phase and the reflex-induced phase of jump landing.

#### Methods:

**Subjects:** Fifteen patients with a grade I or II acute ankle sprain injury were consecutively included. All participants were aged between 18 and 40 years. Patients were excluded if they had a complete (grade III) rupture of the ankle ligament or if they had a recurrent ankle sprain at the same side within the last 12 months. To further exclusion led any neurological, musculoskeletal or other disorders that could influence the measurements. In addition, 15 healthy individuals (matched for sex, age and BMI) were included.

**Testing procedure:** Four weeks after ankle sprain, EMG and kinematic data were collected. The subjects were asked to perform alternately three 25 centimetres barefoot single-leg jumps per leg. Starting from a single leg stance position subjects jumped 25 centimetres forward. Landing was performed single legged. To avoid hopping subjects were asked to stabilize the position after the jump.

Data collection: Ag/AgCL bipolar surface electrodes (AURION ZeroWire, Milan, Italy) were used to record EMG activity of the m. tibialis anterior, m. gastrocnemius lateralis and m. peroneus longus. Subjects were equipped with 20 reflective markers placed on the lower body at pre-defined anatomical points according the Plug-in-Gait-Marker Placement (Input Devices and Music Interaction Laboratory, 2013). Kinematic data were assessed using an optoelectronic motion analysis system (Vicon Mx3+, Vicon Peak, Oxford, UK).

Data processing: EMG signals were filtered, full-wave rectified and processed. The mean pre-activity amplitude was calculated for the interval 30ms before touchdown until impact (pre-initial contact phase). In order to analyse the post-initial contact phase and the reflex-induced phase of jump landings the mean EMG amplitude was analysed between 0 and 30ms and within the subsequent interval between 30ms and 150ms. The EMG data were normalized by using a dynamic normalization procedure. Kinematic data were processed and extracted by VICON motion analysis software and Matlab. In accordance to the EMG analysis the mean displacements of the ankle and knee in the frontal and sagittal plane, and the mean hip displacements in the frontal, sagittal and transversal plane were calculated between touchdown and 30ms as well as for 30ms until 150ms after touchdown. Three trials per subject were averaged for further analysis.

Statistics: Statistical analysis was performed using SPSS 21.0. Data were checked for normal distribution and the following tests have been chosen accordingly. Group mean differences for EMG and kinematic data were calculated using a t-test for independent samples. The alpha-level of each test was set at 5%.

#### **Results:**

Muscle activity of the m. tibialis anterior, m. gastrocnemius lateralis and m. peroneus longus did not differ between the ankle sprain patients and the healthy control group in any of the analyzed intervals (all  $p > 0.05$ ). However, ankle sprain patients had a less plantar flexed position ( $1.46 \pm 5.13$  degree) of the ankle joint during the post-initial contact phase (touchdown - 30ms) and differed therefore significantly from the healthy control group ( $-3.12, \pm 5.19$  degree) ( $p = 0.037$ ). No differences in ankle kinematics were found for adduction/abduction angles ( $p = 0.728$ ). In addition, joint displacements of the knee and hip showed no difference between the groups during any interval (all  $p > 0.05$ ).

#### **Discussion/Conclusion:**

The significant difference of the ankle position during the post-initial contact phase made obvious that ankle sprain patients had an altered jumping respectively landing pattern. On the one hand the greater tendency towards a dorsiflexed position at the ankle observed in the subjects with acute ankle sprain is the position that offered greater protection to the lateral ligament complex. On the other hand these findings reveal fear avoidance behavior because plantar flexion is involved in the injury mechanism. These adaptations can lead to faulty pre-programming of ankle joint movement and contribute to the development of chronic ankle instabilities. Contrary to our expectations no difference between the groups regarding motor control mechanisms could be identified. It might be that the variability in of the performed jumps influenced this result. Several parameters such as sway at end position, jump height and arm swing may have created random errors. Further, we observed several outliers in muscle activity, which might be related to skin movements during the task. Nevertheless, calculations with and without outliers revealed similar results. Future studies with acute ankle sprain patients are needed to undergird and enhance these findings.

#### **References:**

Ashton-Miller, J., Ottaviani, R., Hutchinson, C., & Wojtyls, E. (1996, December). What best protects the inverted weightbearing ankle against further inversion? Evertor muscle strength compares favorably with shoe height, athletic tape, and three orthoses. *American Journal of Sports Medicine*, pp. 800-809.

Bullock-Saxton, J., Janda, V., & Bullock, M. I. (1994). The Influence of Ankle Sprain Injury on Muscle Activation During Hip Extension. *International Journal of Sports Medicine*, pp. 330-334.

(ABSTRACT TRUNCATED)

**Fachbereich**

**Posterpräsentation  
Sozialwissenschaften**

**Title:**

Die Rolle des Benefit-Finding für die Qualität der Anpassung an das Leben nach dem Spitzensport.

**Authors:** Adler Zwahlen J, Seiler, R, Engel R, Schmid J.

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**Abstract:**

**Introduction:**

Die Lebensereignisforschung postuliert, dass die Anpassung an eine durch ein kritisches Ereignis veränderte Situation durch *Benefit-Finding* gefördert wird, indem Menschen Gewinnbringendes für ihr Leben erkennen (Filipp & Aymanns, 2010). Während in der frühen Forschung zum oft als kritisches Lebensereignis beschriebenen Karriereende im Spitzensport Benefit-Finding mitbedacht wurde, wird es in der aktuellen Forschung nur punktuell berücksichtigt (z.B. Curtis & Ennis, 1988, Wippert, 2011). Basierend auf dem Konzept *Kritisches Lebensereignis* (Filipp, 1995) untersucht die vorliegende Studie die Rolle des Benefit-Finding für die kurz-, mittel- und langfristige Qualität der Anpassung an das Karriereende.

**Methods:**

290 Schweizer Spitzenathleten (Frauenanteil: 32.8%) aus 64 Sportarten wurden etwa 7.46 Jahre nach ihrem Karriereende mittels Fragebogen zum Benefit-Finding, Erleben des Karriereendes, zur Dauer und subjektiven Qualität der Anpassung an das Karriereende sowie zum psychischen Wohlbefinden befragt. Die Datenauswertung erfolgte mittels Strukturgleichungsmodellierung.

**Results:**

Das Modell zur Vorhersage der langfristigen Anpassungsqualität (psychische Wohlbefinden) an das Karriereende mit einer Varianzaufklärung von  $R^2 = .26$  passt recht gut zu den Daten ( $\chi^2 = 114.764$ ,  $p \leq .001$ ,  $df = 56$ , CFI = .93, SRMR = .06, RMSEA = .06; AGFI = .91). Wie postuliert, hat das Ausmass von Benefit-Finding einen – über die kurz- und mittelfristige Anpassungsqualität (positive Emotionen, Anpassungsdauer und subjektive Anpassungsqualität) – vermittelten Effekt auf das psychische Wohlbefinden im Leben nach dem Spitzensport.

**Discussion/Conclusion:**

Das Konzept *Kritisches Lebensereignis* kristallisierte sich als zielführender Ansatz für die Analyse von zusammenwirkenden Faktoren hinsichtlich Qualität der Anpassung an das Leben nach dem Spitzensport heraus. Die Befunde indizieren, dass sportpsychologische Interventionen mit Fokus auf Benefit-Finding, zusammen mit anderen Elementen der gängigen Career-Assistance-Programme, kurzfristig für eine gelingende Transition und langfristig ein günstiges psychisches Wohlbefinden sinnvoll sind.

**References:**

- Curtis, J. & Ennis, R. (1988). Negative consequences of leaving competitive sport? Comparative findings for former elite-level hockey players. *Sociology of Sport Journal*, 5, 87-106.
- Filipp, S.-H. (Hrsg.) (1995). *Kritische Lebensereignisse* (3. Aufl.). Weinheim: Beltz.
- Filipp, S.-H. & Aymanns, P. (2010). *Kritische Lebensereignisse und Lebenskrisen. Vom Umgang mit den Schattenseiten des Lebens*. Stuttgart: Kohlhammer.
- Wippert, P.-M. (2011). *Kritische Lebensereignisse in Hochleistungsbiografien. Untersuchungen an Spitzensportlern, Tänzern und Musikern*. Lengerich: Pabst.

**Titre:**

Les classes mixtes aux prises avec l'égalité en éducation physique : une réalité contrastée!

**Auteurs:** Deriaz, D.<sup>1</sup>, Lenzen, B.<sup>1,2</sup> & Couchot-Schiex, S.<sup>3</sup>

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**Abstract:**

**Introduction:**

En Suisse, la généralisation de la mixité à tous les niveaux de la scolarité apparaît dans les recommandations de la Conférence des directeurs cantonaux de l'Instruction Publique (CDIP) du 30 octobre 1981. Malgré ces recommandations, la mixité en éducation physique (EP) n'est pas acquise. Dans le canton de Vaud, les classes non mixtes en EP sont la règle plus que l'exception en fin de scolarité obligatoire. A Genève, la situation est similaire. Le principe de mixité scolaire en EP ne pourrait-il s'appliquer à tous les niveaux de la scolarité? Ce questionnement nous a conduits à nous intéresser au point de vue des différents acteurs de l'école sur la mixité en EP et plus particulièrement sur l'égalité et l'équité entre les deux sexes au regard de l'évaluation, celle-ci étant révélatrice des inégalités entre filles et garçons (Cleuziou, 2000) et de ruptures entre un « discours sur » la pratique et la pratique effective (Deriaz, Poussin & Kaiser, 2001).

**Méthodologie:**

Nous avons distribué un questionnaire « élève » à près de 300 élèves du secondaire I et II, ainsi qu'un questionnaire « enseignant » à 28 enseignant.e.s titularisé.e.s et 27 étudiant.e.s en formation. Les deux questionnaires étaient structurés en trois parties distinctes visant à: (1) identifier les caractéristiques des participant.e.s; (2) accéder à leurs perceptions à propos de la mixité en EP; (3) approcher le positionnement de genre des répondants à partir d'une version courte (Totchilova-Gallois, 2005) du Bem Sexe-Role Inventory (BSRI) pour les enseignants et de la version proposée par Fontayne, Sarrazin et Famose (2000) pour les élèves. Nous avons procédé à des analyses comparatives des résultats en fonction des déterminants personnels à l'aide du logiciel SPSS et avons retenu comme taux de significativité pour nos tests statistiques un risque égal ou inférieur à 5% ( $p < 0.05$ ).

**Résultats:**

Les élèves souhaitent plutôt pratiquer l'EP en classe mixte. Ils sont plutôt divisés quant à l'égalité et l'équité face à l'évaluation, sauf sur le fait que la pratique d'un sport en dehors de l'école est un gage de réussite pour les filles comme pour les garçons. Les enseignant.e.s et les étudiant.e.s reconnaissent un intérêt éducatif à la mixité, mais expriment leurs craintes ou leurs difficultés face à la gestion d'un groupe mixte et aux choix didactiques à opérer. Leurs positionnements face à l'évaluation sont moins déterminés et paraissent plus sujets aux stéréotypes de sexe, principalement chez les étudiant.e.s.

**Discussion/Conclusion:**

Ces résultats témoignent chez les (futur.e.s) enseignant.e.s d'une véritable difficulté professionnelle à instaurer une réelle coéducation égalitaire et équitable en éducation physique. La formation a sans doute un rôle important à jouer, afin d'amener les enseignant.e.s à concevoir « des formes de pratiques scolaires mixtes et équitables » (Patinet, 2011, p.20).

**Références:**

- Cleuziou, J.-P. (2000). L'analyse du menu et des notes. In B. David (Ed.), *Education physique et sportive: la certification au baccalauréat* (pp. 77-124). Paris: INRP.
- Deriaz, D., Poussin, B. & Kaiser, C. (2001). *Conceptions didactiques des enseignants d'éducation physique: une étude à propos de l'enseignement du basket-ball*. Genève: DIPCO.
- Patinet, C. (2011). La nécessité d'une vigilance envers l'équité sexuée. *Revue EPS*, 349, 18-20.
- Totchilova-Gallois, E. (2005). La relation entraîneur-entraîné en sport de haut niveau: analyse du concept de mentoring. Thèse de doctorat en Sciences et Techniques des Activités Physiques et Sportives (non publiée), Université d'Orléans.



## Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg

### Title:

Sportmotorische Leistungsfähigkeit und schulische Leistung – Ein medierender Effekt der exekutiven Funktionen?

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### Abstract:

#### Introduction:

Da die exekutiven Funktionen in enger Verbindung mit schulischer Leistung stehen (Diamond, 2007) interessiert aus sportwissenschaftlicher Sicht, welchen Beitrag Bewegung und Sport zu dessen Erhöhung leisten kann. Korrelative Zusammenhänge zwischen den einzelnen Konstrukten sportmotorische Leistungsfähigkeit (SMLF), exekutive Funktionen (EF) und schulische Leistung (SL) scheinen empirisch hinreichend belegt. Offen bleibt hingegen, welche Wirkmechanismen diesen Zusammenhängen zu Grunde liegen. Dabei werden zwar des Öfteren Moderations- und Mediationseffekte diskutiert (Alfermann & Linde, 2012), selten jedoch empirisch geprüft. Aus theoretischer Sicht ist anzunehmen, dass sportliche Aktivität die exekutiven Funktionen fördern und diese wiederum einen positiven Einfluss auf die schulische Leistung haben. Daher wird im vorliegenden Beitrag untersucht, ob die EF als potentieller Mediator zwischen SMLF und SL fungiert.

#### Methods:

Im Rahmen der Studie „Sport und Kognition“ (SpuK) wurden insgesamt 110 Schülerinnen und Schüler (56.8% ♀; 7.90±0.43 Jahre) in ihrer SMLF und ihren EF getestet. Zusätzlich wurde die SL durch Einschätzungen der Lehrperson erhoben. Um die Annahme zu prüfen, ob die schulische Leistung vorwiegend mediiert über die exekutiven Funktionen durch die sportmotorische Leistung vorhergesagt werden kann, wurde eine bootstrapping-basierte Mediationsanalyse (Fairchild & McQuillin, 2010) durchgeführt.

#### Results:

Das Strukturgleichungsmodell weist eine hohe Anpassungsgüte auf ( $\chi^2(7, N=95)=3.06, p=.880; CFI>.99$ ). Erwartungsgemäss gibt es innerhalb des Mediationsmodells keinen signifikanten Zusammenhang zwischen SMLF und SL ( $\beta=-.12, p=.869$ ) sobald die EF ins Modell aufgenommen werden. Während der Zusammenhang von SMLF auf EF signifikant ausfällt ( $\beta=.69, p=.026$ ), zeigt sich der Zusammenhang von EF auf SL trotz hohem Regressionsgewicht als nicht signifikant ( $\beta=.68, p=.515$ ). Die Mediationsanalyse ergibt dabei weder einen direkten ( $p=.124$ ) noch einen indirekten Effekt ( $p=.472$ ), weshalb die geprüfte Mediation verworfen werden muss.

#### Discussion/Conclusion:

Obwohl die starken Zusammenhänge von SMLF und EF als auch von EF und SL bei gleichzeitig schwachem Zusammenhang von SMLF und SL die theoretische Annahme der Mediation stützen, liess sich die angenommene Mediation in unseren Daten nicht nachweisen. Erklären lässt sich dieser Befund einerseits durch eine eher geringe Stichprobengrösse und andererseits durch eine unzureichende Datenqualität aufgrund inadäquat operationalisierter Schulleistung durch Lehrereinschätzungen. Zukünftige Studien sollten daher zur Messung der schulischen Leistung auf objektive Messmethoden (wie Schulleistungstests) zurückgreifen.

#### References:

- Alfermann, D., & Linde, K. (2012). Physische Aktivität und kognitive Leistungsfähigkeit. In R. Fuchs & W. Schlicht (Hrsg.), *Seelische Gesundheit und sportliche Aktivität* (S. 294-314). Göttingen: Hogrefe.
- Diamond, A., Barnett, W. S., Thomas, J., & Munro, S. (2007). Preschool program improves cognitive control. *Science*, 318, 1387-1388.
- Fairchild, A. J., & McQuillin, S. D. (2010). Evaluating mediation and moderation effects in school psychology: A presentation of methods and review of current practice. *Journal of School Psychology*, 48, 53-84.

**Title:**

The impact of early field experience on curriculum planning and didactic interactions in physical education

**Authors:** Lenzen, B; Poussin, B., Deriaz, D., Cordoba, A. & Dénervaud, H.

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**Abstract:**

**Introduction:**

In Switzerland, teacher training programmes do not include systematically early field experience. At the University of Geneva, the choice had been made to include training courses in primary and secondary schools during Bachelor's and Master's degrees in movement and sport sciences for student teachers (STs) who wanted to become PE teachers. This paper accounts for a part of a larger study aiming to assess the impact of early field experience on curriculum planning and didactic interactions in physical education. It focuses on STs' progresses all along the PE lessons they were giving during their academic programme.

**Methods:**

The setting for this investigation involved four PE STs' first and second field experiences respectively labelled « Intervention 1 » (during Bachelor's degree) and « Intervention 2 » (during Master's degree). These course modules were year-long theoretical and practicum courses. We collected (a) lesson plans and (b) transcriptions of didactic interactions in class. Planning data was assessed on a seven level scale according to four task components (aim, setting, assessment criteria and action rules) (Famose, 1983 ; Gréhaigine, 1996) and three planning principles for decontextualised or contextualised tasks (Ubaldi & Olinger, 2006). Didactic interactions data was analysed regarding to a joint action theory in didactics (Sensevy & Mercier, 2007).

**Results:**

Comparison between STs' lesson plans in « Intervention 1 » and « Intervention 2 » shows that STs became more regular, precise and relevant, especially when planning the same task for successive lessons. However, they continued to have difficulty in planning action rules (Gréhaigine, 1996) that pupils had to learn. This planning difficulty was accompanied by difficulty in regulating pupils' activity during PE lessons, especially in contextualised tasks when trying to conduct « debates of ideas » (Deriaz, Poussin & Gréhaigine, 1998) with their pupils.

**Discussion/Conclusion:**

Our findings show a positive impact of early field experience on curriculum planning and to a certain extent on didactic interactions in physical education, but they raise questions about articulation between Intervention courses (where STs are supposed to begin to learn *how* to plan and teach) and practical sport courses (where STs are supposed to learn *what* to teach). Of course, we plan to collect data from more participants to confirm these conclusions. We also plan to study what happens when STs go on with the teacher training programme and are appointed in a school to teach PE.

**References:**

- Deriaz, D., Poussin, B. & Gréhaigine, J.-F. (1998). Les jeux sportifs collectifs à l'école : le débat d'idée. *Revue EP&S*, 273, 80-82.
- Famose, J.-P. (1983). Relations pédagogiques et tâches motrices. Vers une science de la conception en éducation physique. In La relation au sein des APS. N° spécial, *Revue Sport et Science*. Paris : Editions Vigot, pp. 41-95.
- Gréhaigine, J.F. (1996). Les règles d'action : un support pour les apprentissages. *Revue EPS*, 260, 71-73.
- Sensevy, G. & Mercier, A. (Ed.) (2007). *Agir ensemble. L'action didactique conjointe du professeur et des élèves*. Rennes : Presses universitaires de Rennes.
- Ubaldi, J.-L. & Olinger, J.-P. (2006). Des options collectives. In J.-L. Ubaldi (Ed.), *L'EPS dans les classes difficiles. Entre fils rouges et lignes jaunes* (pp. 24-34). Paris : Editions Revue EP.S.

## Abstract für die 6. Jahrestagung der SGS 2014 in Fribourg/Freiburg

### **Titel:**

Kompetenzen von Sport unterrichtenden Lehrpersonen der Vorschul- und Primarschulstufe: Ergebnisse einer zweistufigen Delphibefragung im Rahmen des Projektes KopS

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### **Einleitung:**

Sport unterrichtende Lehrpersonen sollten in der Lage sein, Sportunterricht entsprechend seinem Bildungsauftrag (Fries, Baumberger & Egloff, 2009) zu gestalten. Dies verweist auf bestimmte Kompetenzen, welche eine Lehrperson ausweisen muss (vgl. Baumert & Kunter, 2006), um ebendiese Zielsetzungen im Unterricht anzusteuern. Aus wissenschaftlicher Perspektive herrscht jedoch Uneinigkeit darüber, was (Sport unterrichtende) Lehrpersonen wissen und können sollten oder welche Kompetenzen besonders wichtig sind (Bauer, 2002). Dieser Frage wird im Forschungsprojekt KopS (Kompetenzprofile für das Fach Sport auf Vorschul- und Primarschulstufe) nachgegangen.

### **Methode:**

Im Rahmen einer zweistufigen Delphibefragung wurden in einer ersten Runde ausgewählte Lehrpersonen mit Expertenstatus der Vorschul-, Unter- und Mittelstufe in halbstrukturierten Interviews zu den aus ihrer Sicht notwendigen Fähigkeiten für unterrichtende Lehrpersonen des Faches Sport befragt ( $N_1 = 16$ ). Daraus wurden mittels qualitativer Inhaltsanalyse nach Mayring (2008) stufenspezifische Kompetenzen abgeleitet. In der zweiten Runde wurden die gewonnenen Kompetenzen Fachdidaktikerinnen und Fachdidaktiker verschiedener Pädagogischer Hochschulen der Deutschschweiz ( $N_2 = 10$ ) in einem strukturierten Interview vorgelegt und nach deren Kommentierung und Beurteilung der Kompetenzen bezüglich Wichtigkeit gefragt.

### **Ergebnisse:**

Die drei schulstufenspezifischen Kompetenzraster aus der ersten Delphi-Runde weisen zwischen 30-62 Kompetenzen auf. Diese sind stufenübergreifend ähnlich, wobei sich die Kompetenzen der Vorschule tendenziell von jener der Primarschule abgrenzen lassen: Im Bewegungs- und Sportunterricht im Kindergarten wird insbesondere das Arrangieren von motorisch herausfordernden Raum- und Materialerfahrungen als zentral erachtet. In der Schule werden dagegen sportpraktisches und organisatorisches Können von Lehrpersonen als bedeutungsvoll eingeschätzt. Allen drei Kompetenzrastern werden sportunterrichtsspezifische Kompetenzen zu den Bereichen Organisation, Unterrichtsstruktur, sport- und bewegungsbezogenes Fachwissen, Beurteilung, Interaktion, Kommunikation und Sicherheit genannt. Die von den Lehrpersonen beschriebenen Kompetenzen werden von den Fachdidaktikerinnen und Fachdidaktiker als wichtig erachtet und nur marginal ergänzt.

### **Diskussion:**

Mittels des beschriebenen Verfahrens wurden erstmals Kompetenzen von Sport unterrichtenden Lehrpersonen auf Vorschul- und Primarschulstufe erfasst. Die Ergebnisse zeigen, dass die sportspezifische Tönung der Kompetenzen Unterschiede zu bisherigen Kompetenzdarstellungen für Primarlehrpersonen nahelegt und es erforderlich ist, Kompetenzen stufenspezifisch zu diskutieren.

### **Referenzen:**

- Bauer, K.-O. (2002). Kompetenzprofil: LehrerIn. In H.U.O.T. Rauschenbach & P. Vogel (Hrsg.), *Erziehungswissenschaft: Professionalität und Kompetenz* (S. 49-63). Opladen: Leske & Budrich.
- Baumert, J. & Kunter, M. (2006). Stichwort: Professionelle Kompetenz von Lehrkräften. *Zeitschrift für Erziehungswissenschaft*, 9 (4), 469-520.
- Fries, A.-V., Baumberger, J. & Egloff, B. (PH Zürich) (2009, 18. November). *Zum Auftrag des Faches Sport in der Volksschule. Eine Diskussionsgrundlage*. Zugriff am 24. Mai 2012 unter [http://www2.phzh.ch/ForschungsDB/Files/367/Auftrag\\_Sport\\_27\\_11\\_09.pdf](http://www2.phzh.ch/ForschungsDB/Files/367/Auftrag_Sport_27_11_09.pdf)
- Mayring, Ph. (2008). *Qualitative Inhaltsanalyse – Grundlagen und Techniken* (10., neu ausgestattete Aufl.). Weinheim: Beltz.

**Abstractvorlage 6. Jahrestagung der SGS 2013 in Fribourg/Freiburg**

**Title:**

The effect of gender on the work of women sports journalists in the Swiss daily press

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**Abstract:**

This study investigates the specificity of women sports journalists' writing in the context of the French-speaking Swiss daily press. By analysing their working practices (observations and 27 interviews) and their output (content analysis), it shows that women sports journalists do not adopt the customary professional norms and values of this journalistic speciality and tend to produce unconventional articles. This "feminine" writing is characterized by an interest in soft news and a psychological or "human" perspective which is different from the usual treatment of sports news focused on facts and technical analysis developed by the large majority of their male colleagues. It takes place within structural mechanisms – particularly modes of recruitment, gender division of labor, the acknowledgement of skills and the organisational mechanisms within sports newsrooms - as well as daily interactions in the workplace and the taste of women journalists. Women journalists employ a subversive strategy and play with the stereotypical images of their professional competences. However, the way they exercise their profession contributes to the definition of masculine and feminine journalistic values and practices and to the maintenance of the existing gender order in sports journalism.

**References:**

Djerf-Pierre, M. (2007). The gender of journalism. The structure and logic of the field in the twentieth century. *Nordicom Review*, 28, 81-104.

Gill, R. (2007). *Gender and the media*. Cambridge, Great Britain: Polity Press.

Hardin, M., & Shain, S. (2006). Feeling much smaller than you know you are: the fragmented professional identity of female sports journalists. *Critical studies in media communication*, 23(4), 322-338.

Schoch, L., & Ohl, F. (2011). Women Sports Journalists : Between Assignment and Negotiation of Roles, the Swiss Case. *Sociology of Sport Journal*, 28(2), 189-209.

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