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Abstracts 2016

# Masterarbeiten Master of Science in Physiotherapie (MScPT) Studiengang 2013



# Editorial

Sehr geehrte Leserin, sehr geehrter Leser

Wir freuen uns, Ihnen hiermit die Sammlung der Abstracts der Masterarbeiten des vierten Studiengangs MSc in Physiotherapie zu überreichen.

Ob Assessments, Interventionen oder Grundlageforschung, unsere Studierenden haben ihre Masterarbeiten in den verschiedensten Gebieten gemacht und diverse Forschungsmethoden angewendet. Sie haben systematische Reviews und Metaanalysen, Studien über die Entwicklung und Anwendung von neuen Technologien und Behandlungsmethoden, Validitäts- und Reliabilitätsstudien oder Begleitevaluationen in den verschiedensten Fachgebieten durchgeführt.

Wir sind stolz, Ihnen heute diese Sammlung von spannenden und thematisch breiten Masterarbeiten zu präsentieren.

Mit dieser Broschüre verbinden wir auch unseren herzlichen Dank an die Dozierenden und die Betreuerinnen und Betreuer der Masterarbeiten für ihre kompetente und professionelle Unterstützung der Studierenden sowie des Studiengangs. Ihnen ist es auch zu verdanken, dass über die Hälfte der Masterarbeiten schlussendlich in peer reviewed Fachzeitschriften veröffentlicht wird.

Wir freuen uns über Ihr Interesse an diesen Arbeiten und wünschen Ihnen anregende Lektüre.



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# Cross-sectional study on the influence of the height of high-heeled shoes on the kinematics and kinetics of the pelvis and the spine during walking

Up to 78% of women regularly walk in high heels. However, up to 58% complain about low back pain, which is commonly thought to be caused by increased lumbar lordosis. However, it remains unknown to what extent the posture of subjects with and without high-heeled shoes is actually modified during dynamic activities. Therefore, we aimed to evaluate whether low- or high-heeled shoes influence the kinetics and kinematics of the pelvis and the entire spine during walking.

Twenty-three inexperienced and seventeen experienced high-heeled-shoe-wearing women (aged 20-55) were measured barefoot, while wearing low- (4 cm) and high-heeled (10 cm) shoes during gait at a self-selected speed. A 3D motion capturing system (Vicon) and five force plates were used to assess the gait patterns and loading for each condition.

No significant inter-group differences in any kinetic and kinematic parameters were found. Low-heeled shoes hardly influenced the subjects' posture. Surprisingly, both groups showed significant lower lumbar and thoracic curvature in the high-heeled shoes, compared to the barefoot condition. In addition, inexperienced high-heel wearers showed less thoracic curvature while wearing high compared to low heels.

Contrary to previous results that suggest that women's spinal curvature is unchanged due to high heels during static standing, this study shows that the heel's height influences the motion of the pelvis and of the entire spine while walking. These results indicate that back pain may be more associated with the decreased curvature and the kinetics involved in walking.

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# Visuomotor Adaption in Parkinson's Disease – The Role of the Basal Ganglia for Reinforcement Learning

**Introduction:** Adaptation, a form of motor learning is defined as a gradual improvement in performance in response to modified conditions. Improvement relies on two different kinds of prediction errors. Sensory prediction errors (SPE), strongly linked with the cerebellum and reward prediction errors (RPE) which are linked with the basal ganglia. Current evidence shows that a period of binary feedback of task success creates a more stable motor memory in healthy subjects. The aim of the present study was to investigate whether these effects could be observed in patients with a known basal ganglia dysfunction.

**Methods:** 19 patients diagnosed with Parkinson's disease (PD) and 10 healthy controls were recruited for this non-randomized controlled study. Participants were assigned to the SPE group, RPE group or healthy control group. Participants performed a throwing experiment where they adapted to visuomotor prism rotation. After a baseline phase participants adapted to 16° visual displacement. The adapted behavior was then consolidated either due to RPE or SPE. After a short 2. adaption phase (21°) participants performed no-vision trials where they received no feedback about their performance. Directional errors, learning rate, variability and task success were calculated to quantify their motor performance.

**Results:** Motor performance during the forgetting phase was analysed with a two-factorial ANOVA (repeated measure). The results revealed no significant effect for directional error ( $F_{2,668, 48.02} = 0.931, p = 0.422$ ), no effect for the interaction ( $F_{5,337, 14.24} = 1.202, p = 0.317$ ) and no effect for group ( $F_{2, 26} = 0.335, p = 0.718$ ). Single-factorial ANOVA also showed no significant group differences for variability and success rate.

**Conclusion:** Neither PD patients nor the healthy controls showed motor forgetting. For this reason, it is not possible to conclude that the processing of RPE is located in the basal ganglia. Furthermore, motor performance between PD\_SPE group and PD\_RPE group did not differ. These effects may be explained by the huge interindividual variability of the motor performance and also due to methodological reasons. Further research should examine visuomotor adaptation in RCTs to reduce biasing effects.

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# Neuromuscular hamstrings activity during stair descent and after reflex-induced tibia perturbation in ACL-intact and ACL-deficient subjects: A cross-sectional descriptive pilot study

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**Background:** Anterior cruciate ligament (ACL) injuries rank among the most common injuries in sports. It has been suggested that pre-activity and re-active neuromuscular response regulate muscle stiffness, influencing dynamic knee-joint stability. Furthermore, it has been shown that abrupt tibia perturbation induces a reflex response of the hamstrings, which may be a protective mechanism. Therefore, the aim of this study was to investigate neuromuscular hamstrings activity between ACL-intact (ACL-I) and ACL-deficient (ACL-D) participants during stair descent and after artificially induced tibia perturbation.

**Methods:** 26 ACL-I (13 female, 13 male) and 6 ACL-D (3 female, 3male) subjects participated in this descriptive cross-sectional experimental pilot trial. The electromyographic (EMG) muscle activity of M. biceps femoris (BF) and M. semitendinosus (ST) were evaluated in five and four sequential time intervals, respectively (T0: -50-0 ms, T1: 20-40 ms, T2: 40-60 ms, T3= 60-95 ms, T4: 0-120 ms). Root mean square values during stair descent and after the activation of the stretch-reflex measurement in the full weight-bearing position were extracted and individual means out of 20 steps and 30 stretch reflexes per extremity for each muscle were calculated. For the descriptive statistics mean, standard deviation and 95% confidence intervals were reported. Between-group comparisons were tested with the non-parametric Mann-Whitney U-Test ( $\alpha = 0.05$ ).

**Results:** During stair descent, ACL-D participants demonstrated average reduced neuromuscular BF activity in T0, while average increased BF activity was detected in T1-T4 (T0:  $p = .69$ ; T1:  $p = .92$ ; T2:  $p = .88$ ; T3:  $p = .80$ ; T4:  $p = .73$ ). After induced tibia perturbation, ACL-D participants showed average increased neuromuscular BF activity in T1 and T2 (T1:  $p = .96$ ; T2:  $p = .26$ ), whereas average decreased neuromuscular ST activity was seen in T1 and average enhanced activity was observed in T2 (T1:  $p = .73$ ; T2:  $p = .73$ ).

**Conclusion:** ACL-D participants showed altered neuromuscular hamstrings EMG activity during stair descent and after induced tibia perturbation compared to ACL-I participants. ACL-D participants may use different neuromuscular strategies than ACL-I participants. It is concluded that different neuromuscular mechanisms may be used for dynamic knee-joint stability.

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## Usability-Studie zur Akzeptanz und Bedienerfreundlichkeit eines Exergames mit älteren Personen und Physiotherapeuten

**Hintergrund:** Exergames werden immer häufiger als Trainingsmethode in der Physiotherapie mit älteren Personen eingesetzt.

**Ziel:** Das Ziel dieser Studie ist zu evaluieren, ob ältere Personen und Physiotherapeuten Exergames als (Selbst)-Trainingsmethode akzeptieren und als benutzerfreundlich einstufen.

**Methode:** Es wurde eine Usability-Studie mit 14 älteren Personen und 13 Physiotherapeuten durchgeführt, die quantitative und qualitative Aspekte erfasste. Dazu wurden Usability-Kriterien definiert, welche erfüllt sein müssen, damit das Exergame als benutzerfreundlich angesehen werden kann.

**Ergebnisse:** Alle Usability-Kriterien wurden erfüllt. Insbesondere die Kriterien zur körperlichen Anstrengung der älteren Patienten wurden zu 100% erfüllt. Das Einschalten des Exergames bereitete den älteren Patienten am meisten Mühe, insbesondere denen, die keinen Computer zu Hause haben. 10 Physiotherapeuten schätzten den therapeutischen Nutzen des Exergames als gut ein und 12 befürworteten den Einsatz als selbständige Trainingsmethode zu Hause. Die älteren Patienten sahen den Einsatz des Exergames eher in der Physiotherapie.

**Schlussfolgerung:** Im Grossen und Ganzen haben die älteren Patienten und die Physiotherapeuten das Exergame positiv eingeschätzt und könnten sich vorstellen, solche Exergames in der Therapie anzuwenden.

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# Untersuchung der Dokumentation von Red Flags in der Befundaufnahme bei Patienten mit lumbalen Rückenschmerzen am Beispiel von Studierenden des Bachelor Studiengangs Physiotherapie der ZHAW. Eine Dokumentenanalyse

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**Einleitung:** Ein zentraler Punkt in der Qualitätssicherung in der Physiotherapie ist die Frage, ob Physiotherapeuten Red Flags im Rahmen der Befundaufnahme systematisch erfassen. Ziel: Ziel der vorliegenden Studie ist es zu untersuchen, wie und in welchem Umfang das Wissen über Red Flags im Zusammenhang mit Rückenschmerzen im Bachelor Studiengang Physiotherapie (BScPT) an der Zürcher Hochschule für angewandte Wissenschaften (ZHAW) unterrichtet wird und inwiefern Studierende im Zusatzmodul C Red Flags in der Befundaufnahme von Patienten mit Rückenschmerzen systematisch dokumentieren.

**Methode:** Es wurden zwei Skripte aus dem muskuloskelettalen Modul des BScPT analysiert. Ergänzend wurden Interviews mit Dozierenden durchgeführt. Zudem wurden die anonymisierten Befunddokumentationen der Studierenden analysiert.

**Ergebnisse:** An der ZHAW werden Red Flags im BScPT von Anfang an in klinischen Bildern unterrichtet. Red Flags zu drei von fünf klinischen Bildern, waren auf der Mehrheit der 74 untersuchten Befundbogen (70-98%) dokumentiert. Die am häufigsten auf den Befundformularen vorgedruckten Red Flags waren auch am häufigsten dokumentiert.

**Diskussion/Schlussfolgerung:** Obwohl nicht zu allen klinischen Bildern gleich häufig dokumentiert wurde, scheinen Red Flags in der Befundaufnahme die gebührende Aufmerksamkeit zu bekommen. Angesichts der Problematik der Überbehandlung ist es angebracht, in zukünftigen Untersuchungen darauf zu fokussieren, wie unnötige Diagnostik und Behandlung vermieden werden kann, und wie Patienten möglichst schnell zu adäquater Information und Therapie kommen.

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## Beginning of a new era, Physiotherapy 2.0 – opportunity to establish

### Study design: Position Paper

**Introduction:** Social Media (SM) is a powerful tool for communication and has an influence on health issues. At end of 2015 there were more than 1 billion people worldwide, who searched for information on facebook every day. The Web 2.0 offers users the option to be not only a consumer but also a producer of information. This also led to an increase in the exchange of health information. With increasing demand for security, trust and quality in health-related data exchange, the need for health professionals who offer their expertise in SM also increases.

**Positions:** 1) Physiotherapy can be placed as a reputable provider of health information in SM. 2) The conventional form of therapy in the clinical setting can be associated with the digital world and thus reinforce the positive effects. 3) It is important to protect against data abuse both the patient and the therapist to obtain the full potential of SM to be used in online communication. 4) Guidelines are essential for the establishment of Physiotherapy 2.0. With a joint effort by politicians, researchers and clinicians these guidelines need to be developed.

**Conclusion:** To develop an innovative Physiotherapy 2.0 it requires common effort between research and active use of SM in the clinical setting. In future the health care system has to handle the challenge of increasing costs by increasing needs. Social Media can contribute to saving costs and supporting patients to become proactive with their health.

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# Beeinflussende Faktoren für die Teilnahme an einem Bewegungsförderungsprogramm – Begleitforschung zur Kampagne «60plus -lustvoll mobil»

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**Hintergrund:** Die Kampagne «60plus -lustvoll mobil» wollte die ältere Bevölkerung von Winterthur mit Vorträgen, individueller Beratung, Gangsicherheits- und Rhythmikkursen für die Wichtigkeit von körperlicher Aktivität sensibilisieren.

**Ziel:** Das Ziel war die Untersuchung der Faktoren, welche eine Teilnahme an der Kampagne beeinflussten, um für zukünftige ähnliche Kampagnen Empfehlungen zu formulieren.

**Methode:** In einer Querschnittsstudie wurden die Teilnehmenden der Kampagne mit separaten Fragebogen zu den vier verschiedenen Angeboten befragt.

**Ergebnisse:** Das meistgenutzte Angebot war mit 195 Besuchern (35% Fragebogenrücklauf, n=68) die Beratung, am zweithäufigsten der Vortrag mit 75 Besuchern (61% Fragebogenrücklauf, n=46). Häufigste Förderfaktoren an einem Angebot teilzunehmen waren für den Vortrag «Neugierde» (76%), für die Beratung «Wunsch mehr zu wissen» (64%), für den Gangsicherheitskurs (n=16) «Gangsicherheit» (94%) und für den Rhythmikkurs (n=7) «Verbesserung des Gleichgewichts und der Leistungsfähigkeit» (71%). Die am häufigsten genannte Barriere für die Teilnahme an einem Angebot war «kein Bedarf».

**Schlussfolgerungen:** Die 60plus Bevölkerung zeigte reges Interesse am Vortrag und der Beratung zur körperlichen Aktivität. Neugierde und der «Wunsch mehr zu wissen» waren die häufigsten Förderfaktoren zur Teilnahme. Die Kurse wurden hauptsächlich problemorientiert und zielgerichtet besucht.

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## Comparison of proprioceptive acuity of the cervical spine in healthy adults and adults with CNLBP: a cross-sectional study

**Background:** Despite its importance in posture and alignment of the trunk in relation to the head, there are no studies available investigating the relationship of neck proprioception and chronic non-specific low back pain (CNLBP). The purpose of this study was to evaluate the relationship between neck proprioception and CNLBP.

**Methods:** Cervical joint reposition error was measured in neutral head position, 30° and 60° left and right head rotation, five times consecutively. The main outcome measure was the mean cervical joint repositioning error of the head.

**Results:** Forty-six participants with (n=24, 54yrs ±16yrs SD, 14 females) and without (n=22, 36yrs ± 13yrs SD, 13 females) CNLBP pain were included in the study. The results of the comparison of mean cervical joint repositioning error between patients and healthy controls showed no statistically significant group difference in any of the applied positions. The median and interquartile range in participants with CNLBP compared to healthy controls with Mann-Whitney U-Test were: neutral head position: 3.27° (1.65-6.27) to 2.38° (1.58-3.22) with p=0.21, 60° left rotation: 1.57 (1.04-2.25) to 1.99 (1.13-2.54) with p=0.36, 30° left rotation: 2.05° (1.15-3.13) to 1.46° (1.03-2.48) with p=0.31, 30° right rotation: 2.70° (1.12-4.70) to 2.14° (1.51-4.19) with p=0.98, and 60° right rotation: 1.87° (1.09-3.24) to 2.26° (1.71-4.07) with p=0.23. An overshooting tendency for both groups was found for neutral head position. There was a statistically significant group difference for age in the current study (p<0.01).

**Conclusion:** Physiotherapists should encourage people suffering from CNLBP to go back to normal movement as soon as possible to avoid decreased mobility. This study can be seen as a step towards better understanding the nature and consequence of somatosensory impairment in CNLBP. For future research, we recommend to concentrate more on neutral head position and on testing procedures like the trunk-to-head test.

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# The association of standing variability with the M. soleus Hoffman reflex – An observational study on healthy adults

Information about the variability of a motor task, like standing, is thought to hold information about the status of sensory motor control system (SMCS) and the quality of motor control performance (MCP). It is known that pathologies or perturbations of the peripheral or central system lead to adaptations in the variability of MCP. The Hoffmann reflex (HR) is commonly used to study adaptations within the peripheral neural system to provide information about peripheral information integration during motor tasks. The aim of this study was to investigate the association between postural sway (PS) and HR. 25 participants had to perform six different standing conditions in random order. Vision and weight perturbations were used to challenge postural stability in a gradual fashion. The association between postural sway components and HR of the soleus muscle, normalized to the background EMG (HRB), was investigated using an ANCOVA for repeated measures. Vision perturbation provoked an isolated increase in the linear sway component (LSC) ( $F=42.2$ ;  $p<0.001$ ), whereas weight led to an isolated increase in sway regularity shown in a decrease in the entropy sway component (ESC) ( $F=11.7$ ;  $p<0.001$ ). HRB was concordantly associated with ESC ( $F= 10.3$ ;  $p=0.002$ ) and a trend towards an inverse association with LSC ( $F=3.1$ ;  $p=0.08$ ) was visible. The specific and isolated change provoked by the weight and vision on PS and the found associations lead to the conclusion that different mechanisms in the SMCS lead to specific variability behaviour and depressed integration of peripheral information in the neural HR loop.

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## Crosstalk considerations in studies evaluating pelvic floor muscles using surface electromyography in women: a scoping review

**Background:** Surface electromyography (sEMG) using intravaginal probes is of widespread use for assessing pelvic floor muscles (PFM) activity in women. Although considered as a reliable method, its validity has been called into question due to the presence of a phenomenon called crosstalk. Crosstalk is described as the recording of sEMG activity originating from neighboring muscles rather than coming exclusively from the muscles being investigated. The purpose of this review was to provide an overview of existing literature about crosstalk during intravaginal surface electromyographic recordings.

**Methods:** A scoping review was performed according to the Arksey and O'Malley framework. An electronic search was conducted on six relevant databases. Additionally, authors were directly contacted to identify grey literature. Data extraction consisted of descriptive numeric analysis as well as thematic analysis, which were conducted by two independent reviewers.

**Results:** Forty-nine references written by 34 authors coming from 13 different countries constitute the body of evidence of the present review. Eight main themes have been identified through the thematic analysis. The included material varies greatly in terms of methodology, approach to the crosstalk problem and depth of analysis.

**Conclusion:** A gap in knowledge affecting the validity of the current sEMG investigation methods was identified. Literature addressing the crosstalk problem is scarce and often flawed. Definitive conclusions are regularly drawn from an insufficient basis of evidence. Further research is therefore deeply necessary, although it remains unclear whether this issue can be solved at all with current technology.

Betreuungsperson

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# **Adverse events following arthroplasty of the proximal interphalangeal joint: a systematic review of terms and standard definitions**

The objective of this systematic review was to search the literature for any adverse events occurring after PIP (proximal interphalangeal) joint arthroplasty, definitions of these events, and definitions for the general term complication. The threshold for recording and reporting of complications after PIP joint arthroplasty varied considerably between the studies. This review calculated a complication rate of 56% and a revision surgery rate of 19%, in which loosening, deformities and implant fractures are the main occurring adverse events. In total 26 adverse events were found, of which 13 were defined. Furthermore three definitions for the term complication itself were detected, which referred to unexpected events that potentially compromise the clinical result and may lead to a revision surgery. These findings serve to generate a standardized protocol for assessing and reporting of complications after PIP joint arthroplasty, which is essential for an evidence-based evaluation after surgery

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# Development and validation of an ICF-based Incontinence Assessment Form (ICF-IAF) for urinary or faecal incontinence – A mixed-methods study to explore barriers and resources of affected women

**Aims:** The aim of this study was to identify the problems and resources of women with urinary or faecal incontinence based on the ICF-framework and detecting the impact on the personal environment and quality of life. This study forms part of a project with an overall goal to enable a standardized planning and evaluation of interventions in a multiprofessional setting.

**Methods:** To answer the study question a mixed-method sequential design with a priority to the quantitative approach was considered appropriate. Regarding methods, focus groups were chosen to collect data. Transcripts were analysed with content analysis and identified concepts linked to the corresponding ICF-categories by two different raters. Cohen's kappa was calculated for interrater reliability.

**Results:** Thirteen women with a mean age of 69.9 years were recruited. Four focus groups were conducted, whereas saturation was reached after two groups. Over all transcripts 99 defined ICF-categories at second level could be linked (body functions = 31, body structures = 5, activities and participation = 33 and environmental factors = 30) whereas 4 categories were not sufficiently covered by the ICF (3= personal factors, 1=not covered).

**Conclusions:** This study has determined 103 resources and problems based on the ICF-model of women with urinary or faecal incontinence. In spite of these results, it was shown that four concepts are not fully covered by the ICF-framework. The current data highlight the importance of an extension of the ICF-model, especially towards personal factors of patients.

### Betreuungsperson

Lorenz Radlinger, PhD

# Changes of the perspective selection during motor imagery in patients with neurological diseases: A longitudinal study

Research showed that motor imagery (MI) and actual movements share cortical networks. There were investigations about the imagery perspective (internal, first-person view, or external, third-person view) in healthy populations. Several studies gave special attention to the internal perspective. However, no study has investigated the spontaneous perspective selection in Stroke (STR), Multiple Sclerosis (MS) and Parkinson's disease (PD) patients. Therefore, the aim of the present study was to assess the MI ability and perspective of those patients. In particular, the study investigated whether there is a change in MI perspective between four measurement events (ME). In total, 52 patients, 23 STR, 25 MS and 4 PD were analyzed. We included 25 women and 27 men, 24 to 85 years old and their level of independence with Barthel Index (EBI) 36 to 64 points. All patients underwent three different assessments to gauge their MI ability and perspective selection. We used the Mental Rotation and Mental Chronometry tasks and the Kinesthetic Visual and Imagery Questionnaire (KVIQ-G) and created for each KVIQ-G movement two points of view (internal and external). The frequencies of perspectives indicated clearly that the majority of patients preferred an internal perspective. Axial movements like trunk forward flexion, head flexion/extension and shoulder elevation were imagined more frequently from an external perspective. Patients were even more likely to imagine movement from an internal perspective on the kinesthetic subscale than on the visual subscale. Patients did stay consistent in tiny movements like moving thumb to fingertips or foot external rotation. Changes in MI ability were only significant in the MR scores for the STR group. Our results indicated that chronic patients are more likely to be consistent in perspective selection. Also, the consistency of perspective selection is dependent on the type of movement. Multi-segmental, gross or more proximal located movements may trigger another perspective. The perspective depictions were suitable to evaluate the spontaneous perspective selection in our patients. Perspective selections may depend on the complexity of the movement. Also, our results support the claim that MI training with perspective evaluation will be supportive for clinicians in acute and chronic patients.

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# Cardiopulmonary- and hemodynamic responses during resistive loading- and continuous positive airway pressure in patients with COPD

**Introduction:** Due to obstructive breathing and hyperinflation, patients with COPD show an abnormal breathing pattern with enhanced intra-thoracic pressure changes that might result in pathologic blood pressure changes. As patients with COPD at rest have steeper blood pressure changes than healthy controls, adding resistive load (RLB) and/or conducting continuous positive airway pressure (CPAP) throughout the entire breathing cycle may additionally influence blood pressure changes in patients with COPD.

**Objectives:** To evaluate whether acute breathing with RLB and CPAP has an impact on the speed of beat-to-beat changes in systolic blood pressure (vSBP, mmHg) in patients with COPD and in age-gender matched controls. **Methods:** Non-invasively obtained continuous hemodynamic measurements of beat-to-beat arterial blood pressure was recorded with the Finometer<sup>TM</sup> device. vSBP (mmHg) was assessed by calculating the mean of absolute successive inter-beat-interval differences of oscillatory fluctuations in SBP.

**Results:** In both groups highly significant within group differences of vSBP during RLB and CPAP have been found. In subjects with COPD, vSBP increased from 3.4 (SD±0.9) mmHg/IBI at rest to 4.8 (SD±1.4) mmHg/IBI at RLB3 (p=0.001) and 5.2 (SD±2.0) at CPAP15 (p<0.001). vSBP increased from 2.6 (SD±0.5) mmHg/IBI to 5.0 (SD±2.0) mmHg/IBI at RLB3 and 4.4 (SD±1.8) mmHg/IBI at CPAP15 in the healthy control group (p<0.001). There was a positive association between the level of resistance and vSBP in both groups.

**Conclusion:** vSBP (mmHg) significantly increased during RLB and CPAP compared to rest in both groups. However, patients with COPD do not have steeper blood pressure changes than healthy controls.

### Betreuungsperson

A.J.R. van Gestel, PT, PhD

# Gibt es einen Zusammenhang zwischen der Profitorientierung eines Spitals und dessen Mortalitätsrate? Eine systematische Review und eine Metaanalyse

**Fragestellung:** Die Privatisierung im Spitalsektor der Schweiz wirft die Frage auf, ob mit der zunehmenden Profitorientierung die Behandlungsqualität vermindert wird. Studien zu diesem Thema stammen aus den USA und kommen zu unterschiedlichen Resultaten. Diese Arbeit hat das Ziel entsprechende Studien aus Europa und USA zu untersuchen.

**Methode:** Eine Systematische Review wurde durchgeführt. Für die Kategorie des Spitals wurde der Besitzerstatus (öffentlich, nicht profitorientiert und profitorientiert) gewählt. Die Variable für die Behandlungsqualität ist die Mortalität (Spitalmortalität und 30-Tage-Mortalität). Die Literatursuche wurde in der Periode 23.6.15-1.3.16 in elektronischen Datenbanken, online verfügbaren Fachzeitschriften, Fachpublikationen verschiedener Institutionen und Bibliotheken durchgeführt. Die gefundenen Studien wurden mit einem Random-Effekt Modell metaanalytisch ausgewertet.

**Resultate:** Die Systematischen Review ergab 10'368 Studien. Davon konnten sechs Studien aus den USA selektiert werden. Studien aus Europa konnten nicht eingeschlossen werden. Die Metaanalyse ergab eine Odds Ratio von 1.002 mit einem 95% Konfidenzintervall von 0.65-1.54 und einem p-Wert von 0.99.

**Schlussfolgerung:** Das Resultat der Metaanalyse zeigt keinen signifikanten Zusammenhang zwischen der Profitorientierung eines Spitals und dessen Mortalitätsrate.

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## Effects of continuous passive motion on range of motion, pain and swelling after ACL reconstruction – A systematic review and meta-analysis

**Question:** What are the effects of continuous passive motion on range of motion, swelling and pain after ACL reconstruction?

**Design:** Systematic review and meta-analysis

**Participants:** Patients after ACL reconstruction

**Intervention:** Continuous passive motion

**Outcome measures:** Range of motion, pain, swelling (mean difference or Hedges' g standardised mean difference)

**Results:** Eight studies comprising 442 participants were included into the meta-analysis (five RCTs, two clinical trials, one retrospective study). Beneficial effects of CPM could be identified concerning the need for pain medication (Hedges' g = 0.93; 95% CI = 0.41 to 1.45 during the first 24 hours after surgery; Hedges' g = 0.74; 95% CI = 0.23 to 1.25 on the second postoperative day), the amount of PCA-button pushes by the patient during the first 24 hours after surgery (MD = 31.20; 95% CI = 11.35 to 51.05), on regaining degrees of knee flexion on the third to the seventh postoperative day (MD = 11.6; 95% CI = 1.96 to 21.33) as well as in the third to the sixth postoperative week (Hedges' g = 0.93; 95% CI = 0.41 to 1.44) and on swelling of the knee in the fourth to the sixth postoperative week (Hedges' g = 0.77; 95% CI = 0.35 to 1.18).

**Conclusion:** This meta-analysis suggests that CPM has beneficial effects on pain reduction during the first two postoperative days, on knee flexion during the first to the sixth postoperative weeks and on swelling between the fourth and the sixth postoperative weeks. However, the risk-of-bias scores do not allow a high level of evidence.

Betreuungsperson

Slavko Rogan, MSc, MA

## **Which perspective is selected? The evaluation of motor imagery perspectives in patients with sensorimotor impairments in a cross sectional study**

The imagination of a motor action has been successfully applied in neurological rehabilitation for relearning motor control. Restricted knowledge exists about the spontaneous selected motor imagery (MI) perspective. The present investigation of the internal or external MI perspective selection contributes to an adequate clinical MI training. Therefore, MI perspective selection of 55 patients (25 females; mean age  $58 \pm 14$  years) with sensorimotor impairments was assessed in both visual and kinaesthetic imagery mode using the KVIQ-20 (Kinaesthetic and Visual Imagery Questionnaire-20). Additionally, several patients' characteristics were obtained for determining their relation to imagery capability. Results showed a slight tendency to use an external perspective in patients older than 64 years and a decline to use an internal perspective in patients with a reduced physical activity level. Internal and external MI perspective selection appeared independently from kinaesthetic or visual imagery mode. Axial and proximal movements were more often imagined using the external perspective. Several aspects that could relate to perspective preference are discussed, and suggestions for future studies are formulated.

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## Development and validation of an ICF-based questionnaire (ICF-IAF) for urinary and/or faecal incontinence

**Aims:** The study seeks to explore problems faced by and resources available to male patients with urinary (UI) or faecal incontinence (FI) based on the ICF-Framework. As a result, this research makes a contribution to the development of the ICF-Incontinence Assessment Form (ICF-IAF), which is designed to be a standardised planning and evaluation tool for interventions in a multidisciplinary setting.

**Methods:** A mixed-method sequential design that places emphasis on the quantitative approach was considered appropriate for this study. Focus group interviews (FG) were chosen to collect data. Data were analysed with deductive content analysis and themes identified during FGs were linked to the most corresponding ICF-categories by two raters. Cohen's Kappa was calculated to determine inter-rater reliability.

**Results:** Four FGs were conducted with 13 male participants. The mean age of the participants was 74.7 years. The study was able to identify a total of 73 problems and resources on the 2nd ICF-Level (body functions 26, body structures 5, activities and participation 26 and environmental factors 16), whereby 4 categories were not sufficiently covered by the ICF. The Kappa score for the two raters was 0.82.

**Conclusions:** This study determined 73 problems and resources based on the ICF-Model of men with UI or FI. Additionally, it identified 4 concepts that are not fully covered by the ICF-Framework. While problems are fundamental factors affecting patients, this study found that resources are as important and should not be overlooked in the conventional treatment in both UI and FI-specific assessments.

Betreuungsperson

Barbara Köhler, PT, PhD



# Influence of various stance widths and foot positions on knee alignment in expert and novice squatters

**Objectives:** In squat-training different starting positions and techniques are available. The purpose of this study was to evaluate the influence of various stance widths, foot positions, squat-experience and barbell-load on the frontal knee displacement during squats.

**Design:** observational study

**Setting:** Laboratory for Movements Biomechanics

**Methods:** Nine combinations of three stance widths: narrow (NS); hip (HS); wide (WS) and of three foot positions: 0°; 21°; 42° were investigated. Two conditions: non-load-carrying (O) and barbell-load-carrying (X) were determined. In each position twenty-one novice and twenty-one expert squatters performed the squats under condition O. Additionally, expert squatters performed the squats under condition X (load of 50% body weight). Knee deviation ( $\Delta D$ ) was defined as the deviation from the sagittal plane, where the sagittal plane was adjusted to each investigated position. Kinetics and kinematics were recorded during the whole movement with two force plates and a 3D motion capturing system (Vicon).

**Results:** The smallest amount of knee deviation occurred in positions: NS-0°; HS-0°; WS-0° and WS-21°. Between novices and experts no significant difference was detected and a knee-valgus was revealed only in position WS-0°. The expert group comparison revealed a knee-valgus in positions WS-0° and WS-21°. The between condition comparison revealed a significant difference in position WS-21°.

**Conclusion:** The results indicate that the influence in knee alignment is higher in change of foot position as in change of stance width. Special care must be taken with knee-varus, which appears in eight of nine positions.

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# Reproducibility and validity of gait and postural balance parameters measured by an instrumented treadmill in patients with knee osteoarthritis

Instrumented treadmills are potentially-useful tools for the assessment of gait and balance in the clinic. Aim of this study was to examine the psychometric characteristics of an instrumented treadmill for evaluating postural balance and gait parameters at different speeds and inclinations in knee osteoarthritis patients. 54 patients (mean age 66) with unilateral osteoarthritis were assessed twice using a commercially-available treadmill. Step length, single-limb support and heel and toe forces were recorded during level and uphill walking at 3 and 4 km/h. Centre of pressure path length, area and velocity were evaluated during unipedal stance. We examined discriminant validity (difference between affected and unaffected side), test-retest reproducibility (reliability and agreement), and concurrent validity against an already validated photoelectric system. Significant side differences were observed for single limb support and heel force in all conditions. All the investigated gait parameters showed acceptable reliability, and in some cases also agreement. Concurrent validity (instrumented treadmill vs. photoelectric system) was excellent for step length but poor for single-limb support. On the other hand, neither discriminant validity nor reproducibility were acceptable for postural balance parameters. We conclude that the instrumented treadmill may have good clinical utility for quantitative gait analysis, but not posturography, in KOA patients under different experimental conditions.

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## Best choice for Motor Imagery Ability Assessments = A Systematic Review

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**Objective:** To identify Motor Imagery (MI) and Mental Practice (MP) ability assessments from three different disciplines (medicine, sport and psychology), to review their psychometric properties and evaluate the quality of the study.

**Design:** Systematic Review of studies dealing with MI ability assessments.

**Data sources:** Six electronic databases (PubMed (Medline), Cochrane Library, SPORTDiscus, OvidSP (PsychINFO), Web of Science and WorldWideScience) and manual search of grey literature from April to July 2015.

Study selection: 3082 studies were screened by two independent reviewers. 26 studies which evaluated psychometric properties of MI ability assessments were included. The outcome could be of various methodological qualities which were assessed with the COSMIN rating (CONsensus-based Standards for the selection of health status Measurement INSTRuments).

**Data extraction:** Data were extracted into tables for a clear overview of the contents of the studies. There is one table summarizing all the characteristics of the included studies and individual tables with the psychometric properties and the quality rating.

**Results:** 26 studies with 18 different assessments in four different domains (medicine, sport, psychology, sport psychology) could be identified and evaluated. There were 12 quality ratings on validity and 25 on reliability, respectively. The methodological quality ratings were between poor and excellent.

**Conclusion:** There is a clear lack of validated MI ability assessments. Most of the assessments could be adapted and validated for another target group.

Betreuungsperson

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# The Influence of Gait and Velocity on the Dynamic Navicular Drop – Cross sectional study on healthy subjects

**Introduction:** Variation of gait speed has an influence on kinematic variables that also may have an effect on dynamic foot deformation. The influence of gait velocity on the dynamic navicular drop (ND) has not yet been investigated.

**Method:** The ND was evaluated in static (ND<sub>ST</sub>) and dynamic (ND<sub>D</sub>) conditions using a 3D-motion capture system. ND<sub>D</sub> was evaluated on a treadmill performing three different velocities for walking (0.83 m s<sup>-1</sup>, self-selected speed, 1.67 m s<sup>-1</sup>) and running (1.67 m s<sup>-1</sup>, 2.5 m s<sup>-1</sup>, 3.33 m s<sup>-1</sup>). The ND<sub>ST</sub> was measured by sit-to-stand activity before and after the treadmill exercise. A repeated measures ANOVA and post-hoc paired t-tests were conducted to evaluate differences of ND and the corresponding unloaded navicular height (NH<sub>PS</sub>) and loaded navicular height (NH<sub>L</sub>) during stance for different gait conditions.

**Results:** A total of 20 healthy participants (male, n=15; female, n=5) were analysed for static and dynamic ND conditions. An increase of walking velocity lead to a significant decrease of NH<sub>PS</sub> (0.8 - 1.9 mm) and a subsequent decrease of ND<sub>D</sub> (0.5 - 1.8 mm; p < .001). During increasing running velocity, NH<sub>L</sub> decreased significantly by 0.8 - 1.6 mm leading to an increased ND<sub>D</sub> (1.2 - 1.8 mm, p < .001). For walking and running at the same velocity, there was a large effect size for running with an increase of ND<sub>D</sub> by 83% and corresponding 3.52 ± 1.88 mm (p < .001). Compared to ND<sub>ST</sub>, ND<sub>D</sub> was increased by 284% for walking 0.83 m s<sup>-1</sup> and by 394% for running 1.67 m s<sup>-1</sup>. The ND<sub>ST</sub> did not change significantly after the treadmill program.

**Conclusion:** This study contributes to a better understanding of the influence of gait velocity on the ND<sub>D</sub>. Static ND measures were not confounded by walking and running on a treadmill for 18 minutes. The change of gait from walking to running at the same speed had a large effect on ND<sub>D</sub>. The measures of unloaded NH and minimal loaded NH during stance should be taken into account for the interpretation of ND<sub>D</sub> measures. The magnitude of ND<sub>ST</sub> differs considerably from the magnitude of ND<sub>D</sub>.

Betreuungsperson

Heiner Baur, PhD

# Requirements to train a physiological walking pattern in the Lokomat with a dual task in children with neurological diagnoses

**Background:** Combining Robot-assisted gait training (RAGT) with games enhances repetition, feedback and motivation especially in children. However, daily walking requires more cognitive and motor skills what affects the transferability. Although dual task (DT) training can improve gait related outcomes in certain patient populations, no study evaluated RAGT with DT in children with neurological diseases. Therefore, the aim was to determine functional and cognitive requirements needed to perform a DT RAGT physiologically, and whether leg muscle activation amplitudes change during DT training.

**Methods:** Children (6-18 years) with neurological disorders of the central nervous system (congenital or acquired) were included. We combined RAGT with a newly developed game, where reaching movements were included to increase task-difficulty. Surface EMG-amplitudes of muscles of the more affected leg and dominant arm were recorded. The children walked in the Lokomat in four conditions; with and without reaching movements during normal RAGT and when playing the game. Physiological performance was rated by the therapist. ROC analyses were done to evaluate cut-off points in requirements in respect to physiological task performance. Spearman correlation coefficients were calculated from requirements and achieved game points. Mean EMG-amplitudes to compare DT versus no DT were analysed with the Wilcoxon signed rank test.

**Results:** Twenty-one children participated (7 females, age 6.5-17.3, Gross Motor Function Classification System (GMFCS) level I-IV). In general, children performed the task physiologically when the following activity scores were obtained: GMFCS level I or II, Functional Independence Measure for children (mobility part) >28 points, Functional Ambulation Category level > 4. Similarly, the following body function scores were good estimates: Selective Control Assessment of the Lower Extremity of more affected leg >4 points or Test Of Non-verbal Intelligence >34%. EMG-amplitudes of key muscles during stance were significantly lower after correcting for the biomechanical component during DT compared to no DT.

**Conclusion:** A DT Lokomat training affects the walking pattern and muscle activity depending on children's functional and cognitive characteristics. Compared to regular Lokomat training, a DT Lokomat training might better fulfil the requirements needed for daily ambulation. Such training could facilitate the transfer of learned walking skills to daily ambulation.

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# Elastic Thorax Restriction: Short-term Effects on Pulmonary Function in Children with Cystic Fibrosis: A cross-sectional single-centre study

**Background:** Chest physiotherapy using elastic thorax restriction is generally considered as effective airway clearance technique in cystic fibrosis (CF). However, pulmonary function response to elastic thorax restriction stem from healthy adults. We assessed pulmonary function response to elastic thorax restriction in school-aged children with CF.

**Methods:** Twenty children with CF (12.3±3.4 years) performed pulmonary function tests with and without elastic thorax restriction. Spirometry and body plethysmography assessed dynamic (forced expiratory volume in the 1st second, FEV<sub>1</sub>) and static (functional residual capacity, FRC<sup>Pleth</sup>; residual volume, RV) lung volumes. The Lung Clearance Index (LCI) derived from nitrogen multiple-breath washout (N<sub>2</sub>MBW) estimated global ventilation inhomogeneity. Short-term repeatability at baseline and changes between baseline and during thorax restriction data were analysed.

**Results:** Test-retest repeatability in pulmonary function tests was good. FEV<sub>1</sub> (p=0.004) and FRC<sup>Pleth</sup> (p=0.021) but not RV and LCI significantly decreased in the restricted condition. The analysis of individual pulmonary function dynamics showed heterogeneous short-time responses on thorax restriction.

**Conclusions:** This small study shows that the application of elastic thorax restriction in children with CF may decrease lung volumes while ventilation inhomogeneity remains unchanged. Individual pulmonary function responses appeared heterogeneous, which indicate the potential of personalized chest physiotherapy with careful indication of elastic thorax restriction.

### Betreuungsperson

Philipp Latzin, MD, PhD

# Using spatio-temporal gait parameters under simple and dual task conditions for fall risk detection in elderly people – A cohort study of fallers, non-fallers and persons at risk of falling

**Background:** The high fall prevalence in older persons underline the importance of a proper fall risk management.

**Objective:** (1) To compare gait parameters in elderly fallers, non-fallers and people at risk while normal walking, (2) to check for the additional benefit of assessing those under dual task conditions to identify elderly at risk of falling, and (3) to evaluate thresholds of gait parameters able to distinguish elderly people at risk from non-fallers.

**Methods:** We included 20 elderly fallers, 20 non-fallers and 20 persons at risk of falling. Mean and variability of spatio-temporal gait parameters as well as minimum toe clearance were recorded while walking at a self-selected walking speed, under normal and dual task conditions (counting backwards and enumerating animal names). Optimal thresholds for gait parameters were defined by the Youden-Index.

**Results:** (1) Under both normal and dual task conditions elderly non-fallers showed better stride velocity ( $p < .001$ ), stride length ( $p < .001$ ) and maximum heel clearance ( $p < .006$ ) compared to fallers as well as compared to people at risk of falling. With a predefined sensitivity of 90% the following thresholds were identified: 0.94m/s (sensitivity (Se) & specificity (Sp): 90%) for stride velocity, 1.10m (Se and Sp: 90%) for stride length and 26,46cm (Se: 90% / Sp: 65%) for maximum heel clearance.

**Conclusion:** Stride velocity, stride length and maximum heel clearance can be used to distinguish non-fallers from fallers and people at risk of falling under normal and dual task walking conditions. Determined gait parameter thresholds allow to distinguish between non-fallers and persons at risk of falling.

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## Nutzung von Bewegungs- und Rehabilitationsangeboten nach kurativer Brustkrebsbehandlung

**Hintergrund:** Nach abgeschlossener Brustkrebsbehandlung haben viele Frauen unterschiedliche Einschränkungen, welche die Lebensqualität negativ beeinflussen. Geeignete Therapiemassnahmen können die Situation verbessern und ein regelmässiges körperliches Training kann das Risiko für ein Krebsrezidiv reduzieren. Ziel dieser Studie war die Nutzung von Bewegungs- und Rehabilitationsangeboten zu untersuchen und den Zusammenhang zum funktionalen Gesundheitszustand zu beleuchten.

**Methode:** Frauen nach kurativer Brustkrebsbehandlung am Kantonsspital Winterthur wurden zur Nutzung von Bewegungs- und Rehabilitationsangeboten und zum funktionalen Gesundheitszustand befragt. Die Daten wurden deskriptiv ausgewertet und Unterschiede und Zusammenhänge zwischen der Nutzung und dem Gesundheitszustand wurden untersucht.

**Resultate:** An der Befragung haben 26 Frauen teilgenommen. Ambulante oder stationäre Rehabilitationsprogramme wurden von 6 Patientinnen genutzt. Die Mehrheit der befragten Frauen haben keine ambulanten Angebote genutzt. Ein Drittel gab an, noch stark durch die Brustkrebserkrankung und -behandlung belastet zu sein, etwas mehr als die Hälfte wünschte sich körperlich aktiver zu sein. Der globale Gesundheitszustand und verschiedene Funktionen im Alltag waren bei manchen Teilnehmerinnen deutlich eingeschränkt. Frauen, die an einem Rehabilitationprogramm teilgenommen hatten oder ambulante Rehabilitationsangebote genutzt haben, hatten in vielen Bereichen einen deutlich reduzierteren Gesundheitszustand im Vergleich zu Frauen, die solche Angebote nicht nutzten. Zwischen dem Aktivitätslevel und den verschiedenen Aspekten der funktionalen Gesundheit gab es keine Zusammenhänge.

**Diskussion/Schlussfolgerung:** Rehabilitationsangebote wurden allgemein wenig genutzt und Frauen, die diese Therapieangebote in Anspruch genommen hatten, zeigten eine reduziertere funktionale Gesundheit.

Viele Frauen weisen einen deutlich reduzierten Gesundheitszustand und eine eingeschränkte Lebensqualität auf oder wären gerne körperlich aktiver. Die Nutzung oder der Zugang zu Bewegungs- und Rehabilitationsangeboten sollten in Zukunft verbessert werden.

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# Effects of dynamic balance training with and without visual biofeedback – A randomized controlled pilot study

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**Objective:** This study researched the effect of visual feedback (VFB) of the center of mass (COM) during dynamic balance training (DBT), on trunk sway with a new developed smartphone device combined with a head-mounted display.

**Design:** Assessor blinded randomized controlled pilot-study.

**Methods:** Seniors aged  $\geq 65$  were randomized into either an intervention group (n = 10; with VFB) or a control group (n = 10; without VFB). Over three weeks both groups completed a 20 minutes DBT three times weekly. Trunk sway range and velocity were assessed pre and post intervention with SwayStar™. Walking 10 m (W10), lift and touch the knee during 8 steps (KL), walking 15 m backwards (15BW) and 8 tandem steps (8TS) were assessed.

**Results:** Both groups improved significantly in the total angular area: KL  $F(1,18) = 4.43$ ,  $p = 0.050$ ; 15BW  $F(1,18) = 5.05$ ,  $p = 0.037$ ; 8TS  $F(1,18) = 21.41$ ,  $p < 0.001$ , roll angular range KL  $F(1,18) = 6.19$ ,  $p = 0.023$ ; 15BW  $F(1,18) = 7.49$ ,  $p = 0.014$ ; 8TS  $F(1,18) = 17.41$ ,  $p = 0.001$  and pitch angular range KL  $F(1,18) = 4.49$ ,  $p = 0.048$ ; 8TS  $F(1,18) = 9.37$ ,  $p = 0.007$ . No differences in the W10, between the groups and in the velocity values were observed.

**Conclusion:** A positive effect of DBT on trunk sway was shown. For determine a effect between the groups a longer trial duration and a balance disordered target group is recommended.

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## The effect of obesity in adult women on their dynamic balance capability and their equilibrium strategy

**Background:** Impaired balance is a main risk factor for falls and might explain the higher fall prevalence in obese compared to normal weight people. However, the influence of obesity on the preference of a certain equilibrium strategy to restore an upright posture is not yet well understood.

**Hypothesis:** We hypothesized that obesity leads to a reduced anterior range of the Centre of Pressure (COP) when leaning forward. We further hypothesized that obese women deviate more from the predefined ankle strategy compared to normal weight women.

**Study Design:** Cohort study

**Methods:** Twenty-nine obese and 15 normal weight age-matched adult women (mean age 50 (SD 7.9) years) were studied. Dynamic balance capability was evaluated with a maximal whole body forward leaning during 15s with eyes open and eyes closed. COP sway data as well as kinematic data of the feet and sacrum motions were acquired. The interaction between the angular movement of the lower limb angle and the COP movement in anteroposterior direction was assessed for the evaluation of differences in the equilibrium strategy.

**Results:** No significant group differences were found in balance capability and equilibrium strategy between obese and normal weight women. However, obese people tended to have a larger sacrum range (obese: median 110mm (IQR: 36), normal weight: 82mm (39)) and higher lower limb angle (obese: 6.6° (2.2), normal weight: 4.3° (1.9)).

**Conclusion:** An ankle strategy is used to reach limits of stability. Balance specific treatments might be indicated for obese women with high waist circumference but not for obese women with high BMI.

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# The prevalence of stroke in children and young adults with and without HIV in a rural setting in South Africa, and the possible role of physiotherapy as a measure of tertiary prevention – A Retrospective Case Series Study

**Background:** Acquired immunodeficiency syndrome (AIDS) is a major, global public health problem associated with increased risk for intracerebral haemorrhage and ischemic stroke, especially in young (<46 year) persons. We evaluated limitations imposed by stroke in the daily life of HIV-positive children and young adults from a rural area in South Africa, and examined the role of physiotherapy as a measure of tertiary prevention.

**Methods:** This observational case series study was conducted at Zithulele Hospital, Eastern Cape, South Africa. We included patients <30 years old who had suffered a stroke. The baseline examination included clinical history, neurological examination, mobility scale, participation scale, and the WHO Quality of Life-BREF (WHOQOL-BREF). A follow-up examination was scheduled after six months of regular physical treatment by the rehabilitation team. All data were collected using these tools, and then analyzed by non-parametric methods.

**Results:** Twenty-five patients were recruited; 14 (56%) were women; median age at baseline was 23 years (range: 2 to 30 years). The HIV status of all patients was known: 19 were HIV-positive and six were HIV-negative. Of the 16 left-sided hemiplegic patients, 15 were HIV-positive; of the nine right-sided hemiplegic patients, only four were HIV-positive. Fisher's exact test showed a significant difference by HIV status to the side of the hemiplegia ( $p=0.012$ ). HIV-positive patients did not significantly differ from HIV-negative patients on the mobility scale ( $p=0.30$ ), participation scale ( $p=0.55$ ) and the WHOQOL-BREF ( $p=0.27$ ) at baseline. We observed improvements between baseline and follow-up visits on the mobility scale ( $p<0.001$ ), participation scale ( $p<0.001$ ) and the WHOQOL-BREF ( $p<0.001$ ), irrespective of HIV status.

**Conclusions:** In all young patients who suffered a stroke, regular physical treatment for six months improved quality of life and independence in daily activities. Further clinical studies, ideally randomized controlled trials, should be conducted on young HIV-positive patients who suffered a stroke, so the effectiveness of regular physical treatment by qualified therapists or trained disability workers can be further assessed in a resource-limited setting.

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