

Proceedings
12^{de} VK-symposium

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Provinciaal Administratief Centrum, Gent

Bewegen in **extreme** condities



Editors: Wim Derave en Renaat Philippaerts
Universiteit Gent

Voorwoord

De Vereniging voor Kinesiologie (VK) organiseert dit jaar reeds voor de 12^{de} keer het jaarlijkse VK-symposium. De gaststad is Gent en het thema luidt “Bewegen in extreme condities”. Rond dit thema krijg je 4 gastsprekers te horen van internationaal niveau. We duiken onder de Westerschelde tunnel, we vliegen doorheen tijdzones, we stijgen op de hoogste top van de wereld en wandelen tenslotte op Mars. Voorwaar extreme condities...

Twee belangrijke betrachtingen van de Vereniging voor Kinesiologie zijn 1) het contact te bevorderen tussen de Vlaamse Bewegingswetenschappers onderling en 2) jonge onderzoekers de kans geven om hun werk voor te stellen aan collega's op een 'laagdrempelig' forum. Voor het realiseren van deze betrachtingen is het jaarlijks symposium het belangrijkste middel. Op dit symposium staan jonge onderzoekers centraal, onder meer tijdens de presentatiewedstrijd de 'VK-prijs voor jonge onderzoekers' waar pas afgestudeerde licentiaten hun eerste stappen zetten in de onderzoekswereld. Zowel qua aantal deelnemers als qua kwaliteit van onderzoek is deze wedstrijd de laatste jaren sterk gegroeid. Daarnaast krijgen enkele pas gedoctoreerden de kans om in een 'invited lecture' hun promotiewerk voor te stellen aan het grote publiek. In het afgelopen jaar verdedigden 19 (!) Vlaamse bewegingswetenschappers hun doctoraat, waarvan je er vandaag 3 te horen krijgt. Nooit was het in Vlaanderen zo goed gesteld met de kwaliteit en de kwantiteit van het wetenschappelijk onderzoek in de kinesiologie.

Het symposium wordt georganiseerd onder de OVUNOLO koepel met de steun van de Vlaamse Trainerschool (VTS-BLOSO) en RsScan International, zonder wiens financiële steun dit symposium niet mogelijk zou zijn.

Wij zijn verheugd ook dit jaar een groot aantal deelnemers te mogen verwelkomen in Gent. Wij hopen dat het voor iedereen een stimulerende en leerrijke dag wordt.

Wim Derave
Renaat Philippaerts

**Word gratis lid van de VK op:
www.verenigingkinesiologie.be**



Programma:

12^{de} VK-symposium: 'Bewegen in ~~extreme~~ condities'

9u00

Registratie, koffie en onthaal

9u40

Verwelkoming en opening

Renaat Philippaerts (UGent)

Sessie I (9u45-10u45)

Chairman: Jos Vanrenterghem (Liverpool John Moores University)

9u45

Chronobiologie

Travel fatigue and jet lag: implications for athletes

Jim Waterhouse (Liverpool John Moores University, UK)

10u15

Biomechanica

Walking on Mars

Patrick Willems (UCL, Louvain-la-Neuve)

10u45

Koffie

Sessie II (11u-12u)

Chairman: Wim Derave (UGent)

11u00

Mondeling presentaties VK-prijs voor jonge onderzoekers

De pas afgestudeerde licentiaten/masters (academiejaar 2006-2007) kunnen deelnemen aan deze wedstrijd. Dit vereist een korte mondelinge voorstelling (5 minuten; PowerPoint) en een posterpresentatie. Een deskundige vakjury zal de deelnemers ondervragen en drie laureaten selecteren die respectievelijk 150€, 100€ en 50€ verdienen (geschonken door RsScan International).

12u00

Broodjeslunch met aansluitend posterpresentaties

Sessie III (13u30-14u45)

Chairman: Bart Vanreusel (KULeuven)

13u30

Alpinisme

Bergsport en de cultuur van de uithouding, een sportsociologische duiding

Bart Vanreusel (KULeuven)

Extreme hoogtes: verslag van een geslaagde Everestexpeditie

Bjorn Vandewege (Belgian Everest Climb 2007)

14u15

Arbeidsgeneeskunde

Gezondheidsaspecten van arbeid onder hoge druk: ervaringen vanuit de

Westerscheldetunnel

Tjeerd van Rees Vellinga (Universiteit Amsterdam, NL)

14u45

Koffie

15u00

Proclamatie VK-prijs voor jonge onderzoekers + Algemene Ledenvergadering

Sessie IV (15u20-16u40)

Chairman: Kristiaan D' Août (UAntwerpen)

15u20

Psychologie

Competitiestress: een vloek of een zegen?

Jorge Cottyn (UGent/KATHO)

15u40

Trainingsleer

Wat is de meerwaarde van nuchter trainen?

Katrien De Bock (KULeuven)

16u00

Gezondheid

Cycling to work

Bas De Geus (VU Brussel)

16u20

Revalidatie

Bewegen en revalidatie bij multiple sclerose

Bert Op't Eijnde (PHL Limburg)

16u40

Receptie

Symposium Abstracts

Lezingen op uitnodiging



Travel fatigue and jet lag: implications for athletes

Jim Waterhouse

Liverpool John Moores University, UK

Long-distance travel is increasing in frequency and is a necessary part of a sportsperson's lifestyle, whether he or she is going to a competition or for training sessions. Any long journey (by road, rail or air) will be accompanied by "travel fatigue". This negative effect of travel reflects the combined effects of a changed routine (with possible sleep loss), dehydration, and the hassles associated with travel (dealing with security, passing through customs, and so on). With air travel, there is also the problem of further dehydration due to the hypoxia that arises from breathing air at a reduced pressure in the cabin. The effects of this malaise can be minimised by planning the trip well in advance, by ensuring that documents required for the journey are in order, and by taking a supply of water or fruit juice (not alcohol, which acts as a diuretic) on the trip. On arrival, the traveller is advised to take a shower and to relax with a non-alcoholic drink, to promote re-hydration. Travel fatigue does not prevent sleep at night at the destination, and the traveller can expect to have recovered fully by the next day.

By contrast, if the flight crosses more than two time zones, then, in addition to travel fatigue, there will be the longer-lasting effects of "jet lag". This is a mixture of symptoms that includes fatigue and poor concentration and performance during the daytime, loss of appetite, and difficulties with sleeping during the new night. This assemblage of symptoms reflects the fact that the "body clock" is slow to adjust to the new time zone, even though the individual's environment has changed immediately on arrival. Until adjustment of the body clock has occurred, jet lag can be debilitating, and might also have more important implications if the traveller, soon after arrival in the new time zone, needs to undertake physical or mental tasks that require a high standard of performance. The causes of jet lag are reasonably well known, and so it is possible to offer advice (which applies during the flight as well as, particularly, in the days immediately afterwards) on how to minimise the difficulties. Adjustment of the body clock by appropriate exposure to/avoidance of bright light in the new time zone is the best method, and details of this will be given. Melatonin is quite widely used, but individuals are advised to take medical advice before using this substance.

WALKING ON MARS

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+ *ISTITUTO DI FISILOGIA UMANA, UNIVERSITA' DI MILANO, MILANO, ITALY*

The walking gait is characterized by cyclic fluctuations in the height and forward velocity of the centre of mass of the body. The changes in gravitational potential energy (E_p) and kinetic energy (E_k), due to these fluctuations, are out of phase (as in a pendulum) with the consequence that the changes in total mechanical energy of the centre of mass are reduced. It follows that the increments in the energy of the centre of mass (external work, W_{ext}) are less than the sum of the increments in E_p (work against gravity, W_v) plus the increments in E_k (work to accelerate forward, W_f). The recovery of mechanical energy, due to this transfer between potential and kinetic energy, is $R = 100 (W_f + W_v - W_{ext}) / (W_f + W_v)$. In walking on Earth, R attains a maximum and W_{ext} per unit distance attains a minimum at an 'optimal' speed about 5.5 km h⁻¹. R depends on the relative amplitude and phase of E_p and E_k : R is maximized when the E_p and E_k changes are equal and exactly out of phase. A reduction in gravity would decrease W_v and therefore would require a corresponding reduction in W_f in order to maintain R . However W_f is an increasing function of walking speed; it follows that, in subgravity, walking speed should be reduced in order to match the amplitude of W_f to the smaller W_v (Margaria & Cavagna, *Aerospace Medicine*, 1964). In the present study we tested this prediction.

A force platform (3 m long and 0.4 m wide) was fixed to the floor of an KC-135 and an Airbus A300 aircraft during the 23rd and 24th ESA parabolic flight campaigns. A gravity near that of Mars (0.38 g) was attained for about 30 s during six trials. Three subjects (77 kg, 1.79 m; 92 kg, 1.93 m; 85 kg, 1.79 m) walked back and forth on the platform at different speeds (1.0-4.5 km h⁻¹). A total of 81 steps were analyzed from the platform records to determine W_f , W_v and W_{ext} (Cavagna, *J. App. Physiol.*, 1975). Aircraft acceleration was simultaneously recorded by three accelerometers: the average acceleration during the analyzed steps was 0.4 g in the vertical direction, and average deviation from zero was less than 0.02 g in the forward and lateral directions.

Our results show that when walking on Mars, R would be maximum and W_{ext} per unit distance would be minimum at about 3 km h⁻¹. The minimum value of W_{ext} per unit distance is 0.7-times that on Earth. Due to the lower 'optimal' speed and step frequency, the work required to accelerate the limbs relative to the center of mass (internal work) will also be less on Mars. In conclusion: walking on Mars will be cheaper, but walking speed will be almost half that on Earth.

Gezondheidsaspecten van arbeid onder overdruk, ervaringen vanuit de Westerschelde tunnel

Tjeerd P. van Rees Vellinga

Duikerarts/projectleider ArboUnie

In 1997 werd opdracht gegeven voor de aanleg van de Westerschelde Oeververbinding. De tunnel werd gepland tussen Terneuzen en Ellewoutsdijk. Het zou de eerste geboorde tunnel worden in zachte bodem met een maximale diepte van 70 meter.

De tunnel krijgt een lengte van 6.6 kilometer en bestaat uit twee tunnelbuizen met een diameter van 11.30 meter. De aannemer had elke zes weken hyperbare interventies gepland voor onderhoud en inspectie van de boor. In 1998 werden duikbedrijven en ondersteuning ingeschakeld om de plannen nader te concretiseren. Er werd een risico-inventarisatie en een plan van aanpak gemaakt. De duikers werden gekeurd volgens EDTC richtlijnen, na de duik werden de duikers gecheckt op bellen met behulp van Doppler ultrasound en ten slotte werden er speciale caisson decompressie tabellen gemaakt.

De eerste duik interventies waren met perslucht. De boormachine kwam snel op grote diepte (40m). Omdat er veel fouten gemaakt werden werd de ademlucht vervangen door trimix, een gasmengsel van perslucht met helium. De persluchtgroep is met de trimix groep vergeleken. Het blijkt dat de trimix groep minder decompressieziekten heeft, dat de werktijden langer zijn en dat de stikstofnarcose achterwegen blijft. Op het diepste punt komen beide boormachines vast te zitten. Om het probleem op te lossen worden alle beitels excentrisch geplaatst. Dit vereist langdurige werktijden. Met behulp van een saturatie unit wordt de klus geklaard. In de bouwput staat een saturatie unit waarin duikers voor maximaal 28 dagen in leven en werken onder een druk van 4 bar (G). Met behulp van een shuttle worden de duikers van uit de saturatie unit naar de boorkop gebracht. Is de shuttle aangesloten aan de druksluis dan kunnen de duikers gedurende 4 uur hun werk doen aan de boor onder een nog hogere druk (6.9 bar (G)). Na het werk worden ze terugbracht naar de saturatie unit in de bouwput. De volgende ploeg kan dan worden uitgezonden en zo wordt de productiviteit opgevoerd. Wij hebben de duikers na het duiken onderzocht met Doppler Ultrasound op de aanwezigheid van bellen in de bloedbaan. Onze uitkomsten zijn verrassend. De saturatie excursies veroorzaken minder bellen dan de diepe bounce duiken. Het project van de extremen laat zien dat zorgvuldige voorbereiding en begeleiding vruchten afwerpt voor de gezondheid van de duikers en effectieve inzet van middelen, ook al lijkt in een praktijkproject de nadruk te liggen op tijdschema's en financiële consequenties.

Competitiestress, een vloek of een zegen?

Jorge Cottyn

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KATHO, Torhout

Topturnsters trainen meer dan 20u. per week en oefenen elk element duizenden keren tot ze de perfectie benaderen. Toch komt het vaak voor dat turnsters door wedstrijdstress falen onder druk. Het doel van dit proefschrift was om het falen onder druk te bestuderen bij de balkoefening van turnsters. Als een wedstrijd als een bedreiging wordt ervaren, zullen er negatieve emoties zoals angst ontstaan, maar als die wedstrijd als een uitdaging wordt ervaren, zullen er positieve emoties zoals opwinding ontstaan. Deze emoties gaan altijd gepaard met fysiologische veranderingen in het lichaam. Als men de rol van competitie stress op de evenwichtsprestatie van turnsters wil onderzoeken, moet men dus zowel psychologische als fysiologische metingen uitvoeren. Meestal worden parameters van wedstrijdstress gemeten vóór een sportwedstrijd, maar het is mogelijk dat onverwachte gebeurtenissen tijdens de wedstrijd de wedstrijdstress drastisch beïnvloeden. Metingen tijdens de prestatie zijn noodzakelijk om de relatie tussen wedstrijdstress en prestatie te bestuderen. Eén van de doelstellingen van het proefschrift was dan ook het ontwikkelen van een methode om parameters van wedstrijdstress te meten tijdens een balkoefening.

Hartfrequentie (HF) werd gemeten tijdens de oefening als een fysiologische variabele. Daarnaast werd aan de turnsters gevraagd om na de oefening emoties retrospectief te scoren (RS) terwijl ze keken naar een video-opname van hun balkoefening. Op basis van deze metingen werd een continue lijst van HF en RS gemaakt, waardoor een gedetailleerde analyse van de balkoefening mogelijk werd. Deze methode werd in drie studies toegepast.

In de eerste studie werd gekozen voor een interindividuele aanpak. Dit wil zeggen dat hetzelfde item (zenuwachtigheid) werd gescoord door alle turnsters. Er werd een omgekeerde relatie gevonden tussen prestatie en de retrospectieve score van zenuwachtigheid tijdens de balkoefening, maar dit was onafhankelijk van de metingen vóór de oefening. Deze resultaten tonen de meerwaarde aan van het meten van parameters van wedstrijdstress tijdens de oefening.

In de tweede studie werd een intra-individuele aanpak toegepast door de turnsters zelf de emotie te laten kiezen die het meest voorkwam bij hun beste oefening ooit (prestatie verbeterende emotie, RS+) en de emotie die het meest voorkwam bij hun slechtste oefening ooit (prestatie verminderende emotie, RS-). De wedstrijdstress werd gemanipuleerd door de oefening te laten uitvoeren op drie verschillende hoogtes (LAAG, NORMAAL, HOOG). Een slechtere prestatie werd gevonden in de meest uitdagende conditie, namelijk bij de eerste poging op de hoogste hoogte.

In de derde studie werd het verloop van de HF onderzocht tijdens de voorbereidingsperiode van het acrobatische element. Een daling van de HF wordt gezien als een teken voor het optimaal functioneren van aandachtsprocessen en komt vooral voor bij taken met een externe aandachtsfocus.

In de studie werd een significante daling in de HF gevonden tijdens de voorbereidingsperiode van het acrobatische element bij de pogingen waar er een val was, maar niet bij de pogingen waar er geen val was. Deze resultaten suggereren dat een externe aandachtsfocus (gemeten door de daling in de HF) negatief is voor de evenwichtsprestatie.

De resultaten uit de drie studies tonen aan dat het meten van parameters van wedstrijdstress tijdens het uitvoeren van een balkoefening een meerwaarde kunnen betekenen. Deze methode kan ook gebruikt worden door sportpsychologen bij het begeleiden van atleten.

Metabolic adaptations to exercise in the fasted state

Katrien De Bock and Peter Hespel

Research Center for Exercise and Health, FABER, K.U.Leuven

It is well established that carbohydrate (CHO) intake during exercise improves exercise performance and delays the onset of fatigue. The mechanism behind this can be either enhanced availability of glucose as a substrate for its own metabolism and/or decreased glycogen breakdown, although the latter has been questioned. Research on the effect of CHO intake during exercise on substrate metabolism has often negated the effect of a pre exercise CHO-rich meal, which is a standard nutritional guideline for optimal performance. Thus, the present studies evaluated the effect of exercise in the fasted state versus exercise with CHO intake before and during exercise.

In the first study, the acute effect of exercise in the fasted state versus exercise with CHO intake was evaluated. We could show that intramyocellular lipid (IMCL) breakdown during prolonged submaximal exercise in the fasted state takes place in type I fibres predominantly. Furthermore, IMCL breakdown during exercise was prevented in the CHO-fed state. In addition, the combination of both glucose intake both before and during exercise decreased glycogen breakdown in type IIa fibres. Exercise in the fasting state enhances the post-exercise insulin response to glucose ingestion which in turn likely contributes to stimulation of post exercise muscle glycogen resynthesis. Finally, CHO ingestion is a potent inhibitor of the exercise-induced increase in metabolic gene expression.

It is unclear if exercise in the fasted state can affect training adaptations. Therefore, a second study investigated the effect of a short-term endurance training period (6 weeks, 3 days/week, 1-2 h, 75% VO₂peak) in the fasted state or with CHO intake on training adaptations and substrate utilisation during a standardised exercise bout with CHO intake. Exercise training elicited similar adaptations in maximal oxygen. Neither IMCL breakdown nor fat oxidation rates during exercise were altered by training. However, in muscle there was a tendency towards an increase in proteins involved in fat transport after fasting training, whereas other adaptations were essentially independent of diet.

Furthermore, during exercise muscle glycogen breakdown rate was lower only after fasting training. In conclusion, although substrate utilisation during exercise in the fasted state is markedly different from exercise with CHO intake, training adaptations are only minimally affected. Further studies must evaluate the effect of training in the fasted state on performance.

Cycling to work: Psychosocial and environmental factors associated with cycling and the effect of cycling on fitness and health indexes in an untrained working population

Bas De Geus

VU Brussel

Gezondheid is een belangrijke bekommernis voor iedereen. Beweging en fysieke activiteit kunnen bijdragen tot een betere lichamelijke en ook mentale gezondheid. Bijna 60% van alle verplaatsingen naar het werk gebeurt met de auto en slechts 7% (België) tot 12% (Vlaanderen) gebeurt met de fiets. De woonwerkafstand is in het merendeel van de gevallen geen argument om de fiets niet te nemen. Vijftig procent van alle autoritten is namelijk korter dan 5 km, een afstand die makkelijk met de fiets te overbruggen is.

Dit proefschrift zal zich dan ook in de eerste plaats concentreren rond het onderzoek van de woon-werk omgeving, de bevorderende en belemmerende factoren van fietsen naar het werk en de psychosociale factoren. Er werd een enquête uitgevoerd bij 343 Vlamingen die op minder dan 10 km afstand van hun werk wonen. De resultaten geven aan dat psychosociale factoren de omgevingsfactoren overtreffen. Dit betekent dat de redenen waarom men niet met de fiets gaat werken eerder persoonlijk zijn. En dat de omgeving (fietspaden, veiligheid, ...) als minder belangrijk worden beschouwd. Dit wil echter niet zeggen dat de omgeving geen belangrijke invloed heeft op het fietsgedrag van de mensen. Belemmerende factoren zijn een gebrek aan tijd en interesse in fietsen. Mensen die regelmatig fietsen hechten belang aan het ecologisch-economisch bewustzijn. Bedrijven waar fietsvoorzieningen, zoals douches en degelijke fietsstallingen aanwezig zijn tellen meer mensen die met de fiets komen werken, dan bedrijven waar geen voorzieningen zijn.

Om de fysieke conditie en de algemene gezondheid positief te beïnvloeden moet de inspanning aan minimum een matige intensiteit gedaan worden. Om te onderzoeken aan welke intensiteit er naar het werk wordt gefietst werd de hartfrequentie en de zuurstofopname continue gemeten tijdens een traject met de fiets van of naar het werk. De proefpersonen fietsten aan een matige tot hoge intensiteit, hetgeen overeen kwam met een hartfrequentie en zuurstofopname die hoger lag dan 75% van hun maximale capaciteit. Wat gebeurt er als mensen die zich nooit met de fiets naar het werk verplaatsen aangespoord worden om te fietsen? Gaat hun fysieke conditie en gezondheidsgerelateerde levenskwaliteit positief beïnvloed worden?

Om dit te onderzoeken werden 65 niet-getrainde mensen aangespoord om met de fiets naar het werk te fietsen. Zij werden gedurende 1 jaar gevolgd terwijl er om de 6 maanden werd onderzocht hoe hun conditie en gezondheid evolueerde als gevolg van het fietsen naar het werk. De resultaten geven aan dat de conditie van de fietsers verbeterde in vergelijking met de controlegroep. De maximale externe weerstand nam toe met 5 – 7% en de maximale zuurstofopname capaciteit met 1,5%. Verder bleek dat mannen en vrouwen meer dan 25 km per week moesten fietsen om een verbetering van de conditie te bekomen en dat mannen meer dan 1500 kcal per week en vrouwen meer dan 1000 kcal per week moesten verbruiken. Dit werd gemakkelijk bekomen door minimum 3 keer per week te fietsen en dit gedurende minstens 130 minuten per week. Op het vlak van de psychologische aspecten zien we dat regelmatig fietsen naar het werk een positieve invloed heeft op de vitaliteit en het fysiek functioneren. Fietsen naar het werk lijkt evenwel een beperkte invloed te hebben op bloedparameters, op de bloeddruk en op het lichaamsgewicht.

Concluderend kunnen we stellen dat fietsen naar het werk een positieve invloed heeft op de fysieke en mentale gezondheid. Om fietsen aantrekkelijk te maken bij het grote publiek zullen overheid en bedrijven hun krachten moeten bundelen om het fietsen te promoten en het gebruik van gemotoriseerde voertuigen te ontmoedigen.

Symposium Abstracts

**Deelnemers
VK-prijs voor
jonge onderzoekers
2007**



VK-prijs voor jonge onderzoekers 2007

Deelnemers:

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Prof. Martine Thomis, KULeuven
Prof. Romain Meeusen, VUBrussel
Prof. Em. Frits De Vree, UAntwerpen
Dr. Veerle Segers, UGent

Laureaten:

Eerste prijs: 150 €
Tweede prijs: 100 €
Derde prijs: 50 €

De drie laureaten worden bekendgemaakt om 15u, voorafgaand aan de algemene ledenvergadering.

De abstracts van de drie laureaten worden gepubliceerd in het Vlaams-Nederlands tijdschrift 'Sport en Geneeskunde'.

Verhoogde carnosineconcentraties en verminderde vermoeidheid in skeletspieren van getrainde sprinters door bèta-alanine suppletie

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Doelen: Carnosine is een dipeptide met buffercapaciteit dat is opgebouwd uit beta-alanine en histidine en dat in hoge concentraties voorkomt in de skeletspier. Eerder onderzoek toonde aan dat orale inname van beta-alanine tot een hogere carnosineconcentratie leidt in de ongetrainde skeletspier (Harris et al. 2006). In deze studie werd nagegaan of carnosine niet-invasief gemeten kan worden aan de hand van proton magnetische resonantie spectroscopie (MRS). Daarnaast werd nagegaan of bèta-alanine suppletie gedurende vier weken zorgt voor een stijging in spiercarnosineconcentratie bij getrainde 400m lopers. Tenslotte werd onderzocht of orale bèta-alanine suppletie een invloed heeft op een maximale 400m sprint, en op de prestatie en spiervermoeidheid tijdens een isokinetische test.

Methodiek: Aan dit dubbelblind placebo-gecontroleerd onderzoek namen 15 mannelijke getrainde 400m lopers, met persoonlijke besttijden onder de 52s, deel. De atleten dienden gedurende 4 tot 5 weken oraal 4.8g per dag bèta-alanine of een placebo (maltodextrine) in te nemen. De spiercarnosineconcentratie werd in rust gemeten in de soleus en gastrocnemius aan de hand van proton NMR spectroscopie in een 3T magneet. Alle proefpersonen liepen een maximale 400m op een vlakke indoorpiste en er werden bloedstalen genomen voor en na de inspanning ter bepaling van lactaat. Daarnaast voerden ze ook nog een isokinetische test uit, bestaande uit 5 reeksen van 30 maximale kniestrekkingen.

Resultaten: De spiercarnosineconcentratie bedroeg gemiddeld ~7 mM in de soleus and ~9 mM in de gastrocnemius. Door toedoen van bèta-alaninesuppletie steeg carnosine in de soleus met 47% ($p < 0.001$), terwijl dit voor de placebogroep constant bleef. De stijging in carnosineconcentratie in de gastrocnemius is significant meer uitgesproken in de bèta-alaninegroep (+37%) dan in de placebogroep (+16%). Uit de maximale dynamische contractietest bleek dat de proefpersonen uit de bèta-alaninegroep tijdens de laatste drie reeksen meer kracht konden leveren in post dan in pre, terwijl dit niet zo was voor de placebogroep. De 400m prestatie werden niet beïnvloed door beta-alanine suppletie.

Conclusie: Uit deze studie kan besloten worden dat 1) proton spectroscopie een bruikbare methode is om niet-invasief de carnosineconcentratie te bepalen in de menselijke skeletspier en leidt tot concentraties die vergelijkbaar zijn met eerder gepubliceerde studies met invasieve spierbipten (Harris et al. 2006) ; 2) spiercarnosineconcentratie kan verhoogd worden bij sprintgetrainde atleten door orale bèta-alanine suppletie; 3) een verhoogde spiercarnosineconcentratie spiervermoeidheid kan uitstellen tijdens herhaalde maximale inspanningen van een isokinetische test; 4) een verhoogde bèta-alanineconcentratie niet leidt tot een verbeterde 400m prestatie.

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Tactical decision-making skill in youth soccer players: underlying mechanisms

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Introduction. Talent identification in soccer consists of more than one parameter. Besides physiological, anthropometric and soccer specific predictors of talent, the psychological component including the perceptual-cognitive factor is also important. Perceptual-cognitive skills in soccer are of big importance. The players are constantly confronted with a complex and changeable environment, and they have to pick up the most valuable information in order to make the appropriate decision in the game. This decision making is also influenced by the team tactics, the individual experience, and the own possibilities as a player¹. Deliberate practice activities are activities specifically designed to improve performance². The purpose of this study is to examine the influence of deliberate practice on the perceptual-cognitive skills.

Methods: A group of 63 soccer players (age between 15 and 17) was tested on a perceptual-cognitive skill test. The group consists of 23 players from the regional level, 21 players from the national level and 21 players from the soccer top sport school. Moreover, from the total group, the first 20 players (elite) and the last 20 players (non-elite) on a ranking of the perceptual-cognitive skill test were used for further analysis. All players were asked to fill out a questionnaire³ about their sports practice and participation in and outside the club.

Independent t-tests were used to compare the elite and the non-elite group. To compare the levels (regional, national and top sport) One-Way ANOVA's were used, with the playing level as independent factor.

Results: There is a difference in deliberate practice (the time spent on soccer specific exercises in team and non-team context) between the elite and the non-elite group. The elite practiced 2460 hours and the non-elite 1340 hours. Also between the levels (regional, national and topsport school), a difference has been observed. The players from the top sport school ($3172,1 \pm 829,8$ hours) and the national level ($1902,8 \pm 410,1$ hours) spent more time on specific exercises than the regional level ($850,0 \pm 329,7$ hours).

Players from the elite group practice more on tactical skills on a training session ($9,5 \pm 11,6\%$) compared to the non-elite players ($7,3 \pm 6,4\%$) and show a greater motivation for playing soccer. The elite players register that technique (57,9%) is the most predicting factor for a talented soccer player. The non-elite players found that speed (35,0%) is the most predicting factor. Both elite (10,5%) and non-elite (10,0%) players indicated that tactical skills were not so important for being a talented player as technique and speed.

Conclusions: The best performers on the perceptual-cognitive skill test participated significantly more in soccer specific exercises, according to the deliberate practice theory. Depending on soccer skill and playing level, players' perception about the most important determinants of talent varied. Finally, the results demonstrated the soccer specific validity of the perceptual-cognitive test.

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Relationship between motor skill and BMI in Flemish primary schoolchildren

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Introduction: Prevalence levels of overweight and obesity are dramatically increasing among children worldwide.¹ Next to serious health risks and psychosocial consequences, it is also suggested that there is a relationship between BMI and motor skill in children.² Because obesity influences body geometry and increases the mass of different body segments, the observed differences are often explained from a mechanical point of view. The purpose of this study was to investigate both gross and fine motor skill in overweight and obese primary schoolchildren compared to their normal-weight peers. Possible differences between boys and girls were also examined.

Methods: A total of 117 Flemish primary schoolchildren aged 5-10 y participated in this study. According to the international cut-off points for BMI, participants were classified into three groups: normal-weight, overweight and obese.³ Level of motor skill was assessed using the Movement Assessment Battery for Children (MABC, Henderson & Sudgen, 1992).

Results: (see TABLE 1) Scores for ball skills ($p < 0,05$) and static and dynamic balance ($p < 0,001$) were significantly better in normal and overweight children as compared to their obese counterparts, while a similar trend was found for manual dexterity ($p < 0,10$). There was also an effect of BMI-group on total MABC and percentile score. Again post hoc analyses showed that obese children performed worse. Gender did not significantly interact with BMI-group for any of the scores mentioned above.

Conclusions: This study demonstrates that obese children have lower general motor competence scores than normal-weight and overweight peers. The observed difference is most obvious for static and dynamic balance. It can be suggested that childhood obesity is a possible constraint to develop motor competences, especially in skills involving more body segments. Still, further research needs to consider whether the lower motor competence in obese children is caused solely by the increased mass of body and body segments, given the tendency towards a weaker performance of the obese child on fine motor skills too. Finally, the absence of a linear relationship between BMI and motor skill must be addressed further.

TABLE 1	Normal-weight N=61 (Mean ± SD)	Overweight N=22 (Mean ± SD)	Obese N=34 (Mean ± SD)	F-value
Manual Dexterity	2,1 ± 2,4 ^a	2,2 ± 2,4	3,3 ± 2,9 ^b	2,519
Ball Skills	0,9 ± 1,3 ^a	0,8 ± 1,8 ^a	1,8 ± 2,0 ^b	4,046*
Static and Dynamic Balance	0,9 ± 1,4 ^a	1,0 ± 1,9 ^a	3,8 ± 3,2 ^b	21,760**
Total MABC Score	3,9 ± 3,9 ^a	3,9 ± 5,5 ^a	8,9 ± 6,7 ^b	11,320**
Percentile Score	55,2 ± 30,0 ^a	56,7 ± 23,2 ^a	28,8 ± 24,7 ^b	11,633**

* $p < 0,05$ ** $p < 0,001$ ^{a,b} A different letter indicates that the means of BMI-groups differ significantly (LSD post hoc analyses).

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The effect of physical intervention programs on coordination quality of the lower limbs in persons with Multiple Sclerosis

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Introduction: For many years, MS patients have been advised to avoid physical activity, because symptoms may worsen with an elevated body temperature. However, recent research has shown beneficial effects of exercise training in MS. The present study investigates the coordination quality in terms of stability and accuracy of bilateral leg movements in MS patients before, during and after 20 weeks of exercise therapy.

Methods: Thirty-three MS patients, EDSS-score between 1.5-6.5, were included in this study. Subjects were stratified by EDSS score and randomly assigned to a MS control group (CO, N=8) or one of three interventions groups: resistance training group (RES, N=9), resistance training + electro stimulation group (RES+EL, N=8), or whole body vibration group (WBV, N=8). The intervention programs consisted of 50 training sessions. The CO group did not participate in any training program. This abstract will only discuss data at baseline and after a 10-week period of intervention as the complete training period is not yet finished. Data analyses focused on the relative phasing between the limbs. Two movement patterns: in-phase relative phase $\Phi = 0^\circ$ and anti-phase relative phase $\Phi = 180^\circ$ were studied at 0.75 Hz, 1.00 Hz, 1.25 Hz and 1.50 Hz respectively.

Results: There was no significant effect of the different intervention programs on the motor performance scores. In all groups, in-phase coordination was performed with higher accuracy (AE=8.70°) and stability (SD=11.11°) than anti-phase movements (AE=13.43°, SD=17.50°) at all frequencies. This study shows that different forms of strength training do not influence the phasing accuracy and stability of in-phase and anti-phase coordination patterns in MS patients. These preliminary results should be considered with reservation, because a small increase in strength was achieved after the first intervention period. Therefore it is possible neural enhancements that allow to improve coordination did not occur yet.

Paedobarography of vertebrates during walking

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Most terrestrial vertebrates trust on their limbs for carrying their weight and to locomote. The interaction of the limbs with the substrate (forces or pressure) can thus teach a lot about the animal's gait mechanics. Unlike ground-reaction forces, plantar pressure distributions (paedobarography) are rarely studied in animals, but they may provide more detailed information about the loading patterns and locomotor function of specific anatomical structures (hooves, toes, etc.). With this study, we aim to describe pressures for a large and diverse sample of vertebrate species, focusing on scaling effects and on the correlation between pressure, ecological niche and locomotor style.

Dynamic pressure distributions (RSScan, 300Hz) were measured using a pressure plate for 39 mammal species (spanning the range from plantigrades to unguligrades) and 4 bird species walking in the Antwerp Zoo and in Wild Animal Park Planckendael (Belgium). Analysis focused on peak pressures and forces, centre of pressure displacements and ground-reaction force patterns.

Peak pressure for the complete mammal sample scales to mass $^{1/2}$, higher than predicted assuming geometric similarity. Unguligrades use the same exponent, but have higher absolute pressures.

Graviportal mammals (elephant, rhinoceros, hippopotamus) tend to scale below the regression line, yielding relatively low pressures. A clear foot roll-off pattern and a double-humped ground-reaction profile, typically seen in human walking, were observed in few species.

We conclude that plantar pressure recordings provide valuable data, which allow us to assess several aspects of animal locomotion for a large sample size under semi-natural conditions.

Effect of training and intermittent hypoxia and hyperoxia on erythropoiesis

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Introduction: Hypoxia refers to a physical condition where partial oxygen pressure in the ambient air is below sea level pressure. This decreases arterial PO₂, which triggers renal erythropoietin (EPO) secretion so as to stimulate erythropoiesis at the level of the bone marrow (1). As living at high altitude is a rather inconvenient intervention to prepare for competition, training at simulated altitude has become a popular training method in athletic populations. However, it appears from the available data that the latter procedure is inefficient to stimulate erythropoiesis, probably because exposure time to the hypoxic stimulus is insufficient (2). Recently, Balestra and colleagues found that a single episode (2h) of pure oxygen breathing in healthy volunteers substantially increased EPO secretion (3). This, in combination with observations in breath-hold divers (4), indicates that a rapid fluctuation of oxygen pressure rather than a low absolute oxygen pressure per se might stimulate EPO secretion. Therefore, we investigated whether acute or short-term exposure to alternating hypoxia-hyperoxia, to cause large variations in arterial PO₂, can stimulate EPO secretion and thereby increase red blood cell production in well-trained healthy volunteers. Also, we studied if exercise training had any additive effect on these parameters.

Methods: Sixteen well-trained (VO₂max: 61±2 mL.kg⁻¹.min⁻¹) subjects participated in eight experimental sessions which were separated by 2-3 day intervals. During each session (90 min) one subgroup (n=6) performed intermittent bicycle training. Five exercise bouts (10 min) at 70% VO₂max in hypoxia (~80% Hb-O₂ saturation) were alternated with five 50% VO₂max bouts (10 min) while breathing 100% oxygen. Two other subgroups received either an identical exposure to hypoxia/hyperoxia at rest (n=6), or performed an identical exercise protocol in normoxia (n=4). Blood samples were taken before and 24 hours after the first and the last experimental session.

Results: Intermittent exposure to hypoxia/hyperoxia, either at rest or in conjunction with intermittent exercise, did not increase plasma erythropoietin concentration, neither at the start nor at the end of the intervention period. Furthermore, the immature reticulocyte fraction, blood hemoglobin, red blood cell count and hematocrit were unaffected by the interventions. Red blood cell glutathione levels were similar between baseline and 24h recovery, both in the pretest and in the posttest. However, values were slightly lower in the posttest than in the pretest in all groups (p<0.05).

Conclusions: Intermittent acute or short-term exposure to hypoxia and hyperoxia, either at rest or combined with exercise training, does not stimulate erythropoiesis.

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Effect van de spierlengte op de krachtreductie na verkorting bij geïncubeerde soleï van muizen

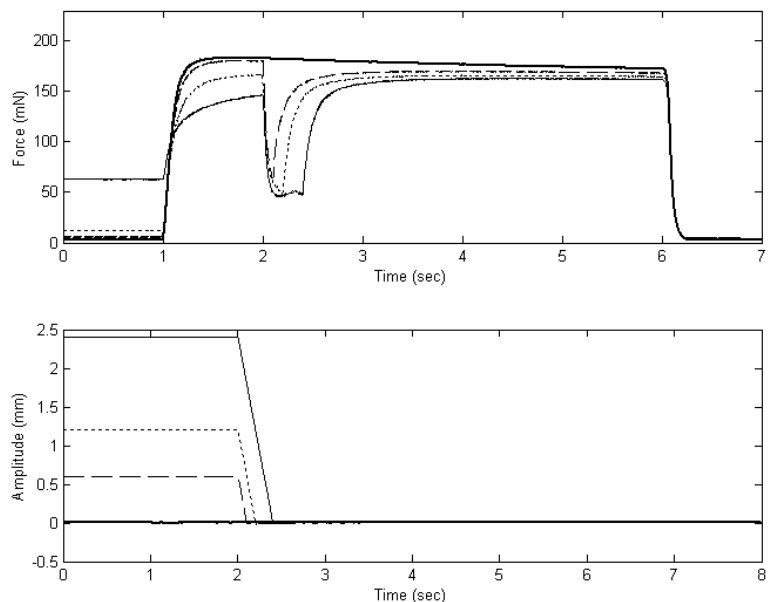
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Introductie: De isometrische krachtproductie na verkorting is lager dan de krachtproductie bij een puur isometrische contractie op dezelfde eindlengte. Dit fenomeen, Force Depression (FD) genaamd, vergroot met toenemende verkortingsamplitudo en is voornamelijk geobserveerd op de optimale spierlengte. Wij zullen FD en zijn afhankelijkheid van verkortingsamplitudo onderzoeken op verschillende eindlengtes om zo een bijdrage te leveren in de zoektocht naar het nog onbekende achterliggende mechanisme.

Methode: 7 Mm. Solei van mannelijke nMRI muizen worden via in vitro supramaximale elektrische stimulatie actief verkort (0,6 mm; 1,2 mm en 2,4 mm) tot op verschillende eindlengtes ($L_0 - 2,4$ mm; $L_0 \pm 1,8$ mm; $L_0 \pm 1,2$ mm; $L_0 \pm 0,6$ mm en L_0). De invloed van de verkortingsamplitudo en eindlengte op FD wordt geanalyseerd aan de hand van ANOVA (repeated measures design) met een significantieniveau van $\alpha < 0.05$.

Resultaten: Op elke spierlengte werd een FD vastgesteld. Bij analyse van de invloed van spierlengte (voor 0,6 mm en 1,2 mm verkortingsamplitudo) had het percentage Force Depression (tov. actieve puur isometrische krachtproductie) een vlak verloop op de stijgende baan van de krachtlengtecurve. Binnen de dalende baan, in vergelijking met de stijgende baan, kent FD wel lengte-effecten. Een toename van verkortingsamplitudo deed FD op alle spierlengten stijgen.



Figuur: FD na 2,4 mm; 1,2 mm en 0,6 mm verkorting op de eindlengte L_0 . De force depression is groter (verschil tussen 'steady state' kracht na concentrische contractie en pure isometrische kracht) naarmate het amplitudo toeneemt.

Conclusies: FD is spierlengte-afhankelijk: de concentrische contracties, eindigend op lengtes net langer dan optimale spierlengte (L_0), genereren het meeste FD. Het effect van verkortingsamplitudo op Force Depression werd op alle spierlengtes vastgesteld..

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Influencing ankle dorsiflexor stress during gait transition by means of pneumatic ankle-foot-exoskeletons has an effect on preferred walk-to-run transition speed.

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Introduction: As walking speed increases, one makes the switch from walking to running. This is called walk-to-run-transition (WRT). The hierarchy of the causes and mechanisms of this changeover have not yet been determined. Previous research proposed a muscular determinant, M. Tibialis Anterior (TA), the main dorsiflexor of the ankle joint. It was demonstrated that preferred WRT speed (V_{wrt}) decreases after preceding exhaustion of this muscle. The current study examined the role of TA as a determinant by loading and supporting it during WRT. It was expected that V_{wrt} would respectively decrease or increase.

Methods: Four subjects (F; 26 ± 3.5 years; 165.7 ± 3.7 cm) performed in each of the four randomly assigned conditions five WRT's in a ramped treadmill protocol. During WITHOUT subjects wore trainers and during CTRL hinged ankle-foot-exoskeletons. During PLT and DORS respectively a plantar- and dorsiflexion moment was applied by McKibben pneumatic muscles attached to the exoskeletons at the instant of the EMG-burst of the TA around heel contact. V_{wrt} , step length (SL) and step frequency (SF) were determined out of sagittal video images and treadmill belt speed. V_{wrt} was defined as the mean speed during the transition step, i.e. the first step with a flight phase. SL and SF (both with respect to step number) of the last twelve steps before WRT were linearly fitted. Perception of the influence of the pneumatic muscles was examined in a questionnaire. Statistical analyses consisted of non-parametric Chi-square and Wilcoxon tests. Results for V_{wrt} were completed with those for four extra subjects .

Results and discussion: Wearing passive exoskeletons minimally influenced spatiotemporal properties of WRT. Influencing TA had a far greater effect (table : c). In the extended population a significantly lower V_{wrt} was found in PLT as opposed to DORS (d), which is confirmed by the perception of the subjects. They experienced DORS as supporting and PLT as impairing. V_{wrt} was also lower (trend) in PLT than in CTRL (b). When comparing the regressions it was found that SL before transition was lower in PLT than in other conditions (f,g). SF was not influenced by PLT or DORS. Consequently lower V_{wrt} was probably caused by smaller SL before WRT. Supporting the dorsiflexors in DORS, as opposed to hindering them in PLT did not result in a change in V_{wrt} compared to CTRL. By assisting the TA another variable in the hierarchy could become the weakest link to trigger WRT, with no obvious change in V_{wrt} as a consequence.

Table : Spatiotemporal properties of WRT: mean (X), standard deviation (SD) and p-value (p) (only trends [$p < 0.1$] and significances ($p < 0.01$) are printed. $\alpha = 4$ subjects, $\beta = 8$ subjects

	WITHOUT		CTRL		DORS		PLT		Trends and significances
	X	SD	X	SD	X	SD	X	SD	P
V_{wrt}^{α} (m.s ⁻¹)	2.10	0.07	2.11	0.10	2.10 ^a	0.08	2.04 ^a	0.06	a= 0.068
V_{wrt}^{β} (m.s ⁻¹)	2.08	0.10	2.10 ^{b,c}	0.10	2.12 ^{c,d}	0.11	2.06 ^{b,c,d}	0.09	b= 0.062; c= 0.006; d= 0.006
SL slope (m.step ⁻¹)	0.010	0.002	0.010	0.002	0.010	0.002	0.010	0.002	/
SL intercept (m)	0.909	0.014	0.926 ^{e,f}	0.014	0.931 ^{e,g}	0.026	0.906 ^{e,f,g}	0.023	e= 0.050; f= 0.068; g= 0.066
SF slope (m.step ⁻¹)	0.026	0.003	0.026	0.003	0.028	0.005	0.028	0.028	/
SF intercept (m)	2.295	0.054	2.295	0.100	0.026	0.081	2.288	0.045	/

Conclusions: Influencing dorsiflexor stress preceding or during WRT affects V_{wrt} . In this study a change in V_{wrt} might have been caused by an altered SL in the steps before WRT. This, however, was in the current experimental setup only the case for impairing these muscles. Altogether, these results suggests that multiple determinants, including dorsiflexor stress, in interaction trigger WRT.

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De relatie tussen omgevingsfactoren en fysieke activiteit van kleuters tijdens de speeltijden

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Doelstelling: Het doel van deze studie was om op schoolniveau en op individueel niveau de fysieke activiteitsgraad van kleuters tijdens de speeltijd na te gaan en te evalueren door welke persoonlijke determinanten en/of factoren uit de schoolomgeving de variantie in fysieke activiteit verklaard werd. In een vooronderzoek werd tevens nagegaan hoeveel stappen per minuut overeenkwamen met een bepaalde intensiteit.

Methodiek: De onderzoekspopulatie voor het hoofonderzoek bestond uit 508 4- tot 6,9-jaar oude kleuters (278 jongens, 230 meisjes) uit 29 verschillende kleuterscholen. De kleuters droegen tijdens één speeltijd een pedometer. Via observatie werd de speelplaatsomgeving geïnventariseerd. De invloed van de verschillende variabelen werd via multiple regressie analyses bepaald. De onderzoekspopulatie voor het vooronderzoek bestond uit 17 5,2- tot 6,3-jaar oude kleuters (10 jongens, 7 meisjes). De kleuters droegen tijdens verschillende opgelegde activiteiten simultaan een pedometer en accelerometer.

Resultaten: Voor alle kleuters samen werd een gemiddelde van $65,40 \pm 31,45$ stappen per minuut gevonden. Jongens zetten gemiddeld significant meer stappen per minuut ($69,15 \pm 32,87$) dan meisjes ($60,91 \pm 29,11$). Op schoolniveau was de verklaarde variantie niet significant en op individueel niveau was deze 19,8%. Een lange speeltijd, meer kleuters per m², meer los spelmateriaal, minder doelen, minder niveauverschillen, een zachtere ondergrond en meer opzichters, gingen gepaard met een kleiner aantal stappen per minuut. Ook de aanwezigheid van specifieke regels limiteerde de fysieke activiteit. Specifiek voor meisjes bleek een harde ondergrond, weinig los spelmateriaal, weinig opzichters en veel doelen een positieve invloed te hebben op fysieke activiteit. Jongens werden positief gestimuleerd door de aanwezigheid van veel niveauverschillen. Via het vooronderzoek werden grenzen bepaald voor elke intensiteit van fysieke activiteit in aantal stappen per minuut. Daaruit bleek dat jongens en meisjes voornamelijk sedentair gedrag vertoonden tijdens de speeltijd.

Besluit: Omgevingsdeterminanten van de speelplaats hebben een invloed op de fysieke activiteitsgraad van kleuters tijdens de speeltijd en ze zijn verschillend voor jongens en meisjes.

Perceiving for action versus perceiving for judging in soccer goalkeepers

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Introduction: According to Milner and Goodale (1995), the human brain disposes of two visual pathways for the control of action. The dorsal stream, passing through the posterior parietal cortex, is mainly responsible for the online visual control, while the ventral stream, via the inferotemporal cortex, is specialised in building internal representations of the visual information. In this study, the use of visual information is studied in expert and lower-level soccer goalies, because during the learning process, a shift takes place from ventral, more cognitive control of actions, towards a dorsal control mode, implying more automaticity. The contribution of both systems is evaluated by presenting the same visual stimuli to both groups in a real interception task as well as in a judgement task.

Methods: Ten professional (1st and 2nd division in Belgium) and ten amateur goalkeepers (regional or recreational level) volunteered in the experiments. In the first experiment, they intercepted 24 plain white soccer balls that were projected frontally from a distance of 16m, in a straight or a curved path that ended at their left or right side, or at their initial position. They were instructed to move so that they could intercept the ball against the chest. Reaction time, defined as the time between the launch of the ball and the first foot movement, and accuracy of the interception, defined as the horizontal distance between the ball and the head at the time of interception (absolute error), were measured from high-speed video (100 Hz). In the second experiment, the same visual stimuli were presented on a laptop screen. Participants had to specify, by means of a button-task, the predicted landing location of the ball as fast as possible after image occlusion (after 300, 600, 900, or 1200 ms). Reaction time and percentage of correct answers were obtained. Pearson correlations between the RTs and accuracy scores of both tasks were calculated, and a 4 (time of occlusion) by 2 (levels of expertise) ANOVA was used to elucidate differences between expert and intermediate goalies in the judgement task, while t-tests were used in the field task.

Results: Reaction times were equal for experts and intermediate players in the judgement task (2104 +/- 594 ms and 2010 +/- 501 ms respectively; $t_{18} = -.385$, $p = .705$). In the field task, no differences between groups occurred either (151 +/- 54 ms versus 153 +/- 32 ms for expert and novices respectively; $t_{18} = .088$, $p = .903$). In the judgement task, both groups showed a comparable accuracy in determining landing location (experts 86.1 +/- 9.1 %, intermediate 83.2 +/- 11.7 %; $t_{18} = -.610$, $p = .550$), while in the field task, the expert goalkeepers were more accurate (absolute error 0.14 +/- 0.046 m versus 0.24 +/- 0.075 m for intermediate keepers; $t_{18} = 3.058$, $p = .007$). Comparing the judgement and field test revealed that accuracy scores did not correlate between these tests ($r = .058$, $p = .809$), as was the case for reaction times ($r = -.334$, $p = .150$).

Discussion and conclusions: Our results are compatible with the framework proposed by Milner and Goodale (1995) in that there is no correlation between making a judgement on a specific visual stimulus, and acting upon it, even if the nature of the stimulus is quasi identical. This finding corroborates the notion of different visual pathways for judging and acting. In the same line of thinking, it is no surprise that the experts outperform their intermediate counterparts in the field test (the situation in which they have built their expertise by exploiting the dorsal stream) but not in the judgement task (which appeals more to the ventral stream). On the practical side, these results once again show that caution is needed when transferring results from judgement tasks that do not involve visually controlled action to the field situation.

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Sport, doping en ethiek: discoursanalyse van geschriften van studenten en journalisten (1998-2006)

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Inleiding: Hoe denken universiteitsstudenten over excessen in de sportwereld? Meer concreet: welke houding nemen studenten lichamelijke opvoeding en bewegingswetenschappen aan tegenover dopinggebruik? Dat is de kern van het onderzoek dat hier wordt gepresenteerd. Het wortelt in de overtuiging dat het interessant is om de standpunten van die studenten in kaart te brengen, te meer omdat veel onder hen later pedagogische en andere verantwoordelijke posities zullen innemen.

Methoden: Om de interesse, de standpunten en de daartoe aangehaalde argumenten van deze studenten weer te geven, werd een studie doorgevoerd van 555 'actualiteitsmappen'. Deze werden tijdens de academiejaren 1998-1999 tot en met 2005-2006 aangelegd door eerstejaarsstudenten lichamelijke opvoeding en bewegingswetenschappen aan het HILO van de Universiteit Gent. Op basis van literatuuronderzoek werd geopteerd voor een toegepast-ethische benadering: enerzijds werden de standpunten ingedeeld in de categorieën 'nultolerantie', 'tolerantie' en 'afzijdig', anderzijds werden de argumenten ondergebracht in de categorieën 'het ik', 'de ander', 'het spel' en 'het schouwspel'. Het betreft hier een door ons ontwikkeld model waarin uiteenlopende ethische aspecten een plaats krijgen, en dat uitgaat van de eenvoudige vraag: wie of wat is er in het geding wanneer doping gebruikt wordt? Ter aanvulling hebben we tevens diepte-interviews afgenomen met een geselecteerde proefgroep van studenten te Gent.

Resultaten: Uit de resultaten van het onderzoek blijkt dat er onder de studenten wel degelijk sprake is van een evolutie in de richting van een minder uitgesproken nultolerantie-standpunt. Vanaf jaargang 2003-2004 daalt het relatieve aantal studenten dat zich radicaal tegen doping keert, terwijl er een toename is in de categorieën tolerantie en afzijdig. Naar argumentatie toe vormen de categorieën het ik en het spel tijdens de eerste zes jaargangen samen de absolute meerderheid: het gezondheidsargument enerzijds en het fair play-argument anderzijds overheersen de discussie onder de studenten. De laatste jaargangen blijven de argumenten in de categorie het spel, met het fair play-begrip op kop, aan de basis liggen van de relatieve instandhouding van de nultolerantie.

Besluit: Samenvattend kunnen we stellen dat de studenten een dalende interesse in het onderwerp doping vertonen, gekoppeld aan een afnemend gezamenlijk antidoping-standpunt dat hoofdzakelijk in stand wordt gehouden door het populaire fair play-argument. Deze resultaten mogen echter niet zomaar veralgemeend worden naar alle studenten aan het HILO, laat staan naar alle universiteitsstudenten van Vlaanderen.

Epiloog: De lichamelijke opvoeding en de schoolsport kunnen als 'moreel laboratorium' (McFee 2004) helpen om de jeugd waarden bij te brengen. Zo dienen faculteiten met een opleiding lichamelijke opvoeding en bewegingswetenschappen het onderwijscurriculum voldoende te richten op de ontwikkeling van kritische meningen en ethische attitudes. Vanuit hun interdisciplinaire roeping dienen ze tevens het onderzoek naar doping en soortgelijke thema's te intensifiëren.

Symposium Abstracts

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The NIRS-signal during ramp cycle exercise: influence of training status

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Introduction: It has been shown that during ramp exercise the course of the deoxy-hemoglobin signal [deoxyHB], which can be considered as an expression of O₂ extraction, is close-to-sigmoid [$f(x) = f_0 + A/(1+\exp(-c+dx))$], indicating that muscle blood flow (Q_m) increases at a faster rate than muscular oxygen uptake (\dot{m}) early in the exercise and then slowed progressively (1). We hypothesised that this non-linear relationship between Q_m and \dot{m} would be more pronounced (i.e. present over a greater range of work rate) in trained cyclists, resulting in a shift of the sigmoid to the right.

Methods: Nine male amateur cyclists (peak = 66.5 ± 2.2 ml.min⁻¹.kg⁻¹) and eight male physical education students (PE students) (peak = 51.8 ± 5.5 ml.min⁻¹.kg⁻¹) performed a ramp cycle exercise to exhaustion, preceded by four minutes of cycling at 50 Watt. The rate of increase in work rate was calculated from a 30 Watt.min⁻¹ ramp exercise (pretest), so that the actual ramp exercise would last approximately 12 minutes until exhaustion for each individual subject. During the test changes in [deoxyHB] were measured at the M.Vastus Lateralis by near-infrared spectroscopy (Oxiplex TS, ISS, Illinois, USA). The [deoxyHB] data were averaged over 10s intervals, normalized to the total amplitude of response from baseline (average of 60s) to peak exercise, set out as a function of work rate (both absolute and % of peak work rate) and fitted using a sigmoid and a hyperbolic model.

Results: In all but one subjects, we observed that [deoxyHB] was best fit by a sigmoid model (in comparison to a hyperbolic model). In the sigmoid function, the c/d-value can be considered as the x-value corresponding to (f₀+A)/2. When [deoxyHB] was expressed both in function of absolute (p<0.001) and relative work rate (p=0.002) c/d was higher in the cyclists (246 ± 39 Watt and 57.8 ± 4.7%, respectively) compared to the controls (178 ± 30Watt and 50.1 ± 3.5% respectively), indicating that the sigmoid showed a shift to the right in the trained subjects. The shift was not related to a change in slope since the d-value, as expression of the slope of the sigmoid model, did not differ between both groups (1.7 ± 0.5 %.Watt⁻¹ for the students and 1.7 ± 0.3 %.Watt⁻¹, p=0.97)

Conclusions: The results of the present study, showing a sigmoid course of [deoxyHB] are in line with the study by Ferreira et al. (2007), suggesting that the kinetics of Q_m are faster than those of \dot{m} at the onset of the ramp exercise. This phenomenon is present over a greater range of work rates in the trained cyclists compared to students PE, indicating that the slowing down of the Q_m is delayed in the cyclists during ramp exercise.

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Exercise therapy in MS patients: Effects of resistance training, additional electro-stimulation and whole body vibration on muscle functional capacity

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Background. One of the most invalidating secondary consequences of Multiple Sclerosis (MS) is muscle weakness and increased muscle fatigue. This may be due to inactivity and/or impaired motor unit recruitment. Recent literature data indicates that exercise therapy may beneficially affect muscle functional capacity in MS-affected persons.

Aim. We examined the effect(s) of long-term standardized (adapted ACSM guidelines) resistance training, either or not in combination with electro-stimulation and whole body vibration on isometric and isokinetic muscle strength.

Methods. A randomized controlled trial was performed in 44 MS-affected persons. At baseline and after 10 and 20 weeks of supervised light (12w, 30% 1RM, 2-3 session/w, 1-2 series) to moderate (12-24w, 60% 1RM, 2-3 session/w, 2 series) resistance training (RES, n=11, EDSS: 4.5±0.4), resistance training combined with electro stimulation (RES+EL, mA range, n=10, EDSS: 4.4±0.3) or whole body vibration training (WBV, 30-45Hz, 1-3 series, 30-60s, n=11, EDSS: 4.5±0.4), maximal isometric (Fisomet; 45, 90°, knee extensors, hamstrings) and isokinetic (Fisokin 60, 180, 240°/s, knee-extensors) strength was measured on an isokinetic dynamometer and compared to a control group (CON, n=12, EDSS: 4.1±0.3). Results are presented in means±SEM.

Results. In CON and WBV, maximal isometric knee-extension and hamstring strength as well as maximal isokinetic knee-extension strength remained stable throughout the study. Following 20w of rehabilitation exercise and compared to baseline and CON, knee-extensor Fisomet45° and Fisomet90° increased ($p<0,05$) with 10.8±5.0 and 10.0±4.3Nm. Hamstring Fisomet45° and Fisomet90° improved ($p<0,05$) with 4.0±2.4 and 2.3±1.9Nm. In RES+EL and compared to baseline and CON, 20w of rehabilitation exercise increased ($P<0.05$), knee-extensor and hamstring Fisomet45° and Fisomet90° with 6.7±2.8, 2.5±3.4Nm and 3.8±2.2, 4.0±2.1Nm, respectively. Isokinetically, 20w of RES rehabilitation exercise enhanced ($p<0.05$) Fisokin60°/s, Fisokin180°/s and Fisokin240°/s, with 15.3±7.0Nm, 16.6±4.9Nm and 15.0±3.8Nm compared to baseline. Finally, compared to baseline 20w, of RES+EL rehabilitation exercise increased ($p<0.05$) Fisokin60°/s, Fisokin180°/s, and Fisokin240°/s with 10.9±2.8, 8.6±3.0 and 5.0±3.1Nm.

Conclusion. Light to moderate intensity strength (resistance) training affects maximal isometric and isokinetic muscle strength in MS-affected persons. Whole body vibration, however, seems to be ineffective.

De ontwikkeling van motorische basisvaardigheden bij kleuters van 4 tot 6 jaar in Vlaanderen - Werpen en vangen

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Introductie.

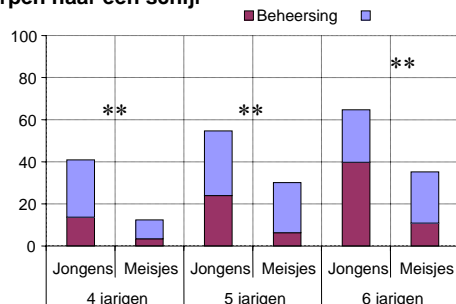
Kleuters en kleuteronderwijzers(essen) staan dit jaar extra in de kijker. Dit heeft alles te maken met het feit dat het schooljaar 2007-2008 in het teken staat van het jaar van de kleuter. De kleuterperiode wordt aanzien als de ideale periode voor het ontwikkelen van motorische basisvaardigheden¹. Het doel van deze studie is om de ontwikkelingsstoestand van het werpen en vangen te rapporteren en en geslachtsverschillen te bekijken.

Methode:

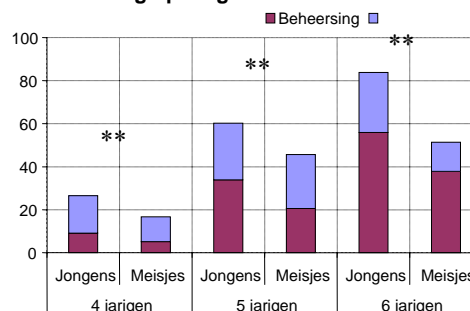
Populatie Gegevens voor dit onderzoeksproject werden verzameld in Vlaanderen en het Brussels hoofdstedelijk gewest. 1208 (654 jongens, 554 meisjes) kleuters uit de tweede en de derde kleuterklas met een leeftijd van vier tot en met zes jaar werden geëvalueerd. Zowel de schooldirectie, de ouders als de kinderen gaven hun toestemming tot deelname aan het onderzoek. **Meetinstrumenten** Evaluatie van de motorische vaardigheden werd uitgevoerd aan de hand van de Motoriktest für Vier- bis Sechsjährige Kinder [MOT 4-6]. Deze test meet de ontwikkeling van motorische bewegingsvaardigheden en bestaat uit 18 speelse opdrachten, waarvan de eerste een gewinningsopdracht is. Data werden verzameld door 22 testleiders.

Resultaten:

Werpen naar een schijf



Tennisring opvangen



** $p < 0.01$

Grafiek 1: Evolutie in de ontwikkeling van werp- en vangvaardigheden bij kleuters naar leeftijd en geslacht

Jongens scoren significant hoger wat betreft het ontwikkelingsniveau van het werpen en vangen. Het vaardigheidsniveau stijgt, zoals verwacht met de toenemende leeftijd.

Conclusies: De precisie van zowel het werpen als het vangen van voorwerpen is bij een groot aantal kleuters nog zeer beperkt. Vooral meisjes tussen vier en zes jaar vertonen een zwakkere ontwikkeling van vang- en werpvaardigheden.

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The feet of habitual barefoot *versus* shod walkers: plantar pressure distribution and arch stiffness

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Introduction : Virtually all our kinesiological knowledge about the human foot is based on studies with Western, habitually shod, volunteers. However, various (often historical) studies have shown that footwear, as well as ethnicity, influences shape, and likely also function, of the foot^{1,2}. As a consequence, our current knowledge may not pertain to the biologically “normal” foot. In this study, we set out to compare shape and function of the foot in three populations: Western subjects, habitually barefoot South-Indians and habitually shod South-Indians.

Methods : 292 Healthy adult volunteers (77 barefoot Indians, 183 shod Indians and 32 Westerners) walked barefoot at preferred velocity over a Footscan plantar pressure plate (RRscan, 0.5m USB type). We collected three good pressure trials for each foot and, for a large subset, also lateral-view video recordings (50 Hz) of the feet. The latter were marked at specific anatomical sites (e.g. malleoli, heads of metatarsals I and V, achilles tendon insertion site, navicular bone). We measured various foot dimensions (length, width at the level of the metatarsals, distance from hallux to toe V), a dynamic foot arch index, and pressures and impulses at various locations (heel, lateral midfoot, medial midfoot, metatarsal heads and hallux).

Results : The Western foot has a more elongated shape than that of both Indian groups. Barefoot walkers differ from shod walkers in having a more fan-shaped toe box. The impulse does not differ between both Indian groups but, interestingly, the barefoot walkers had lower peak pressures at all studied locations. The arch index did not differ between Indian groups. In comparison, the Western group had a slightly (but significantly) higher arch and, interestingly, a much larger variation in arch index.

We saw no effect of footwear on the (static) navicular height, nor on the (dynamic) navicular drop during weight acceptance.

Conclusions : The shape of Western feet differs from both that of barefoot and shod Indians. Likely, footwear habits as well as ethnicity play a role. Functionally, we find some differences between barefoot and shod walkers, specifically with regard to peak pressures. Habitual barefoot walkers may spread pressure better dynamically (by having a smoother roll-off) or structurally, due to the presence of a thick layer of callus.

Overall, we conclude the Western foot functions similarly to the biologically “normal” foot, but for detailed analyses with an ultimate (evolutionary) background, the habitually unshod foot may be preferred.

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The effects of a pedometer-based physical activity intervention on sitting time

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Purpose: Following the success of the pedometer-based intervention “10,000 Steps Ghent”, the aim of this study was to assess whether the intervention had any effects on total, weekday, weekend day, and transport-related self-reported sitting times.

Methods: A quasi-experimental controlled study with pre-intervention and 1 year follow-up measurements evaluated the effects of the intervention. In 2005, 872 randomly selected subjects (aged 25 to 75), from the intervention community Ghent and 810 from a comparison community, participated in the baseline measurements. Of these, 440 intervention subjects (mean age: 49.8 ± 13.1 ; proportion men: 47.5%; proportion employed: 62.4%), and 426 comparison subjects (mean age: 50.0 ± 12.9 ; proportion men: 52.6%; proportion employed: 54.4%) completed a pedometer log and the International Physical Activity Questionnaire in 2006. During the intervention, a local media campaign, environmental approaches, the sale and loan of pedometers, and several local physical activity projects were concurrently implemented.

Results: After one year of intervention, there was a decrease of 0.2 hr (12mins)/day in total sitting time in the intervention community, compared with an increase of 0.3 hr (18 mins)/day in the comparison community ($F = 9.5$, $p = 0.002$). The effects was seen in both weekday ($F = 4.1$ $p = 0.044$) and weekend day ($F = 17.7$, $p < 0.001$) sitting times. No intervention effect was found for transport-related sitting. Total sitting time decreased (-0.3 hr (18 mins)/day in the intervention participants who increased their step counts (average step increase = $2,840 \pm 2,316$; $t = 2.5$; $p = 0.012$). There was no change in sitting time in those whose steps did not increase (mean step change = $-1,814 \pm 1,955$) ($t = 0.8$; $p = 0.427$).

Conclusions: This is the first study to describe the effects of a pedometer-based PA intervention on sitting time. “10,000 Steps Ghent” was successful in decreasing sitting time, as well as in increasing step counts. Present results are preliminary and further research with more objective measures is needed to explore whether focusing exclusively on PA is sufficient to reduce sitting time or whether also separate attention should be given to sedentary behavior.

Genome-wide SNP linkage scan for high-velocity knee strength: The Leuven Genes for Muscular Strength Study

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Introduction. Fast muscle contractions are needed in everyday life, in elite sports performance and in prevention of falls-related morbidity and mortality in the elderly. Results of twin and family studies stress the importance of genes as causal factors in explaining the variance in muscular strength and mass (5) with heritabilities ranging from 31 to 78% dependent on mode and speed of contraction. Several association studies have been performed investigating the relationship between variation in muscle strength performances and single nucleotide polymorphisms in a small set of candidate genes (4). To date, linkage studies have been limited to a set of candidate gene-related markers (1, 2, 3). In an earlier multipoint linkage study of our group (3), three genomic regions (12q12-14, 12q22-23, 13q14) that contain Quantitative Trait Loci (QTLs) for knee strength were suggested within the Myostatin (GDF8) pathway.

Methods. Within a subset of the Leuven Genes for Muscular Strength Study, we performed genome-wide multipoint linkage analyses to identify chromosomal regions harbouring genes influencing high velocity muscle contraction torques of the knee flexors and extensors in young male sibs (n=283) using Illumina's SNP based Linkage IV Panel (6008 markers). Maximal concentric knee strength was measured via Cybex dynamometry at 240°.s-1. Linkage was tested using the Merlin-regress and Variance components procedures.

Results. Linkage analyses revealed significant linkage on chromosome 5q32 at 146.07cM (maximum LOD score [MLS] 3.56) and suggestive linkage on chromosome 7q32.3 at 136.51cM (MLS 3.08) for knee extension peak torque at 240°.s-1. For peak torque of the knee flexors at 240°.s-1, suggestive linkage was found on chromosome 6q15 at 98.68cM (MLS 2.78) and on chromosome 13q12.3 at 24.54cM (MLS 2.78).

Conclusion. To our knowledge, this is the first genomewide scan to explore regions for QTLs that affect knee flexion and extension strength at fast velocities. Interesting regions for further fine-mapping studies are 6q15 and 13q12.3 for knee peak torque flexion and 5q32 and 7q32.3 for knee peak torque extension. The genomic regions that show evidence for linkage within this study do not harbour SNPs that were previously associated with muscle strength related phenotypes.

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Spatiotemporal characteristics of spontaneous overground walk-to-run transition

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Introduction

For the first time, subjects' walk-to-run transition (WRT) was examined during an overground protocol that allowed them to accelerate freely. The primary purpose of this investigation was to examine subjects' preferred overground speed profile prior to reaching transition, and to assess the contribution of step frequency (SF) and step length (SL). The second purpose of this investigation was to reveal the spatiotemporal characteristics of the actual overground transition.

Methodology

The overground speed profile prior to reaching the WRT was analysed together with the spatiotemporal characteristics of the actual transition. Nine women (height: 166.4 ± 3.5 cm) performed five spontaneous WRT. Speed, step frequency (SF) and step length (SL) of the accelerating walking steps and the transition step were determined. By means of 4th degree polynomials, subjects' spatiotemporal profiles prior to reaching WRT were determined. A Step Length Index (SLI) was used to calculate the contribution of SF and SL to the increase in walking speed. An SLI value lower than 50% implies that the contribution of SF for a particular change in velocity is higher than the contribution of SL and vice versa. A repeated measures ANOVA was used to evaluate trends in the speed and SLI profile by comparing data at every 10% of the time to transition (TT).

Results

Subjects took on average 5.9 ± 0.9 walking steps prior to reaching transition. When speeding up towards the transition to running, subjects chose to accelerate predominantly in the first half of the walking acceleration, followed by smaller speed increments in the second half (Fig.1). It was shown that the acceleration decreased significantly during the first half of the TT ($F_{1,8} = 83.166$, $p < 0.01$). During the second half of the TT, the acceleration no longer changed significantly ($F_{1,8} = 0.476$, $p = 0.753$). The SLI values indicated that subjects tended to increase walking speed by increasing SL, more than SF, except during the first 20% of the acceleration period (Fig. 2). The SLI increased significantly during the first half of the TT ($F_{1,8} = 21.425$, $p < 0.01$), after which it did not change any longer ($F_{1,8} = 0.503$, $p = 0.734$). WRT-speed was 2.664 ± 0.230 m.s⁻¹, which was higher than in former treadmill studies (± 2.0 m.s⁻¹). Subjects made a speed jump of 0.417 m.s⁻¹ from the last walking step to the WRT-step.

Conclusion

In conclusion, the apparent differences in both the acceleration strategy and WRT-speed between the spontaneous overground acceleration protocol in the current study and the findings in earlier treadmill protocols, demonstrate the different context of gait transitions in both protocols.

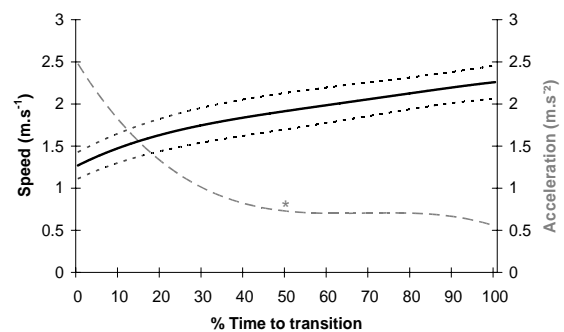


Fig. 1. Mean (black line) and standard deviations (black dotted lines) of the speed profile, plotted against normalised time. Acceleration (grey dashed line) was calculated as the first derivative of the 4th degree speed equation. The asterisk (*) indicates the significant decrease in acceleration during the first 50% of the time to transition.

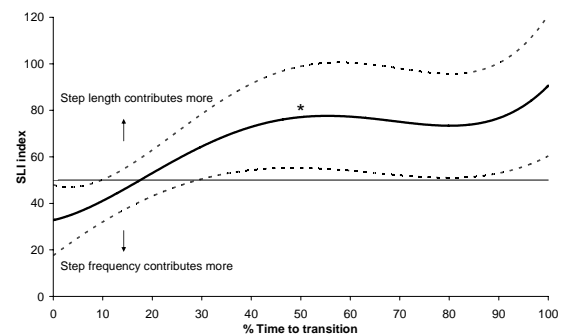


Fig. 2. Mean (black line) and standard deviations (black dotted lines) of the step length index (SLI), plotted against normalised time. The asterisk (*) shows that the SLI increased significantly during the first 50% of the time to transition.

Influence of physical activity on pressure pain thresholds in healthy subjects and patients with non-specific low back pain

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Objectives: To investigate the influence of being physically active or not on pressure pain thresholds (PPT) in patients with non-specific low back pain and healthy subjects.

Methods: The PPT of pencil-marked measuring points with reference to the low thoracolumbar Erector spinae, Gluteus maximus & medius and Tensor fasciae latae (TFL), were determined with the aid of a mechanical Fischer pressure algometer. The comparison of PPTs is made between, for at least 2 years, physical active (SPORT-subgroup) versus not physical active adults (NO-SPORT-subgroup) in respectively a group of healthy men (HEALTH-group, n=42) and matching male patients with subacute (3-12 weeks) non-specific low back pain (LBP-group, n=41).

Results: The mean PPT values of Erector spinae of T6, T10, L1 & L3 and Glutei of the LBP-group were significantly lower with the exception of the TFL, in comparison to the PPT values of the HEALTH-group. An exceptionally high difference (2.8 kg/cm²) was found at the L3 Erector spinae level. The correlation between having LBP or not in the whole group (n = 83) and PPT, was highest at the L3 level of the Erector spinae ($r = -.710$, $p < 0.001$).

When the group of healthy males was divided into a SPORT-subgroup (n=17) or a NO-SPORT-subgroup (n=25), only significantly higher PPT values were noticed ($p < 0.05$) with reference to Erector spinae of L1 & L3 and all examined hip points ($p < 0.01$).

When the group of males with LBP was divided into a SPORT-subgroup (n=17) or a NO-SPORT-subgroup (n=24), it was surprising to notice that there were no significant differences between the PPTs of Erector spinae and all examined hip points.

Conclusion: On one hand, this study in healthy adult male subjects shows the positive impact of active participation in sport on the PPT with reference to the lumbar-pelvic region. On the other hand, it reveals that muscle tenderness of the Erector spinae in patients with non-specific LBP do not differ in function of being physical active or not. In other words: even if a person is a quite physical active person, but hit by backache, the muscular condition is rather equally worsen compared with persons who are not physically active at all.

Age related differences in the impact of visual deprivation on gait

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There are age – related differences in the importance of visual information for static postural control in children and adults [1 – 4]. Because of the importance of adequate postural control during goal - directed locomotion, important age - related differences are also expected in the impact of visual perturbations on dynamic stability and gait. The goal of this study is to investigate and compare the impact of visual deprivation on unperturbed goal- directed locomotion in children of different ages and in adults. Postural sway, step-time parameters and gait kinematics were characterized under three different visual conditions (eyes open, restricted lower visual field and eyes closed) in 20 adults and 40 children with a normal gait pattern and without visual impairments.

Results show that there was a significant interaction between visual condition and age. Differences between eyes open and restricted lower visual field are small. However, many differences are observed between eyes open and eyes closed. The youngest children (3 – 6 year old) performed the worst in the eyes closed condition. Walking speed, stride length and step frequency were significantly smaller while duration of double support and step width were significantly larger. Kinematic differences were a reduced ROM at the head, trunk, pelvis, hip, knee and ankle. Ankle plantar flexion at loading response and at push - off were reduced. Differences were smaller in the 7 – 11 year olds but still more gait parameters differed between the situations than in adults. Most of the observed differences were related to the decrease in self-selected walking speed when walking with eyes closed. However, the increased duration of the double support phase and the more flat foot contact were independent of speed and suggest that the impact of visual deprivation on gait is indeed related to the important role of vision in postural control and dynamic stability.

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EMG-analysis of resisted and assisted dorsiflexion during gait transition

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Introduction: Various studies indicate that the ankle musculature plays an important role in the walk-to-run-transition (WRT). Recently Segers and co-workers found a lowered WRT-speed after inducing local muscular fatigue in the TA by means of a fatigue protocol. The purpose of the present study was to validate the results of Segers et al by means of an experimental manipulation that would act on the ankle specifically around the heel contact phase during the actual WRT acceleration.

Methods: The TA muscular effort was altered by means of a pair of ankle-foot-exoskeletons powered by McKibben pneumatic muscles. 8 female subjects performed 5 WRT's in 3 experimental conditions:

In the resist condition the pneumatic muscles produced TA-resisting plantarflexion torque

In the assist condition the pneumatic muscles produced TA-assisting plantarflexion torque

In the control condition the subjects wore the exoskeleton without the pneumatic muscles.

Results and discussion: We found the lowest WRT-speed in the resist condition, an intermediate WRT-speed in the control condition and the highest WRT-speed in the assist condition (table 1). This indicates an inverse relationship between TA-muscular effort and WRT-speed.

In most subjects and conditions a rising-descending pattern with an apex was observed in the evolution of the integrated EMG of the TA during the activation burst around heel contact (figure 1). This pattern resembles Hreljac's definition of a trigger reaching a critical level with the exception that WRT occurred on average 4 steps after the critical level was reached instead of immediately after. There were significant high correlations between the walking speed corresponding with the apex and the WRT-speed which indicates that the apex and the WRT-are closely linked in time (table1).

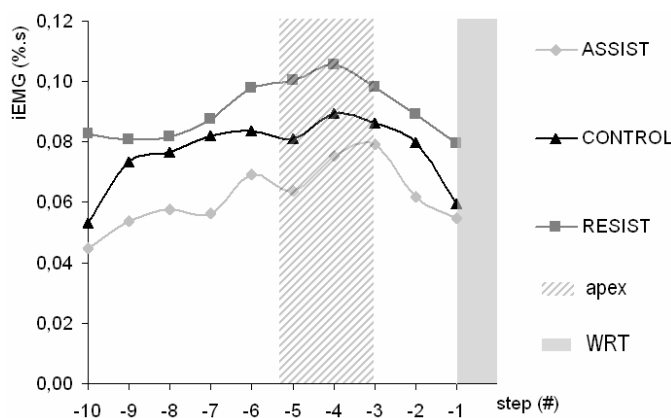


fig 1: evolution of iEMG of the TA during the activity burst in the 10 heel contacts preceding gait transition

CONDITION	WRT-speed	apex-speed	R ²	p
RESIST	2,06 ± 0,09	1,90 ± 0,11	0,89	0,002
CONTROL	2,10 ± 0,10	1,92 ± 0,14	0,88	0,010
ASSIST	2,12 ± 0,11	1,96 ± 0,16	0,89	0,001
TOTAL			0,88	0,000

table 1: average ± standard deviation of WRT-speed, speed corresponding with the iEMG apex, coefficient of determination and significance level of the correlation

Conclusion: The pattern that was found in the EMG of the TA could be interpreted as a trigger reaching a critical level causing the WRT-to happen at a specific speed. These results further emphasise the role of the dorsiflexors in the WRT.

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Talent detection and identification in youth team handball: contribution of anthropometric and performance measures

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Introduction

From the available literature it is apparent that relatively little work has been done on talent identification in team handball (1). A multivariate approach to the problem of talent detection and identification is adopted in this study. The purpose of the present study was to investigate which specific morphological and performance measures describe the detection (comparison with the Flemish reference) and the identification (elite versus sub-elite handball players) process.

Methods:

In the season 2005-2006, 91 youth handball players 12 to 16 years of age playing at different levels participated in the study. From this sample 34 players belonged to the Under 14 age group (U14: age between 12.0 and 13.9 years). The Under 16 age group consisted of 47 players (U16: age between 14.0 and 15.9 years). Players who only represented their club, were assigned to the sub-elite level. Players who were also selected for the Flemish selection team were assigned to the elite level. For the U14 group a Flemish selection team does not exist, resulting only in a sub-elite group.

Flemish reference values for general physical fitness were obtained from a large scale study conducted in 2004-2005. From this sample 430 boys belonged to the U14 age group and 570 boys to the U16 age group.

To test the physical fitness the EUROFIT test battery was used. Apart from the traditional anthropometric data, specific dimensions were taken using standardised protocols (2). The handball specific motor skills consists of a vertical jump, a 5 x 10m shuttle sprint, a handball agility test and a test of shooting accuracy. A maturation index was calculated using the Mirwald formula (3).

Student t-tests were used to compare U14 and U16 handball players with Flemish reference values (detection process). Analysis of variance (ANOVA) and analysis of covariance (ANCOVA) with the maturation index as covariate were used to compare elite U16 versus sub-elite U16 handball players for talent identification purposes.

Results:

Handball players (U16) were significantly taller than the reference group which was not the case in the U14. Physical fitness in handball players was significantly better compared to the reference groups. Multivariate analysis of covariance (maturation as covariate) showed that the elite players were heavier, taller, and had in general greater muscle circumferences than the sub-elite players. Strength, speed and agility was also better in elite players. Discriminant analysis revealed that height, running speed and agility are important parameters in talent identification.

Conclusions:

Specific anthropometric measures are, in addition to some performance measures, useful in talent identification in youth team handball. A maturation index should always be included in multidisciplinary talent identification models.

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Mouth rinse but not ingestion of a carbohydrate solution improves 1-h cycle time trial performance

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Introduction: It is generally accepted that ingestion of carbohydrate solutions during prolonged exercise can delay fatigue. Several studies, however, have reported that ingestion of carbohydrates before and during exercise of relatively short and intense nature leads to an improvement of exercise performance, although there are also a few studies that have found no such effect. Carter and colleagues (2004) suggested a possible role of the mouth on performance improvement after carbohydrate ingestion, by surprisingly showing that mouth rinse (without swallowing) was sufficient to improve a 1-h time trial performance. The aim of this present study was to further explore the influence of ingestion and mouth rinse with carbohydrate-electrolyte solution and placebo on the performance during a ~1h high-intensity time trial with trained subjects.

Methods: Twelve trained triathlon athletes gave their written informed consent to participate in the double-blind, placebo-controlled randomized study. Their mean age, weight, and maximal oxygen uptake were $30,2 \pm 5,3$ yr, $71,7 \pm 7,1$ kg, $61,7 \pm 3,1$ mL.kg⁻¹.min⁻¹. During the first visit subjects performed a stepwise incremental cycling exercise test to exhaustion in order to determine W_{max}. During the next four visits, subjects performed a time-trial by performing a certain amount of work (equal to about 1 hour cycling) as fast as possible. This total amount of work was calculated according to the formula: Total amount of work = $0,75 \cdot W_{max} \cdot 3600$. There were four randomized experimental conditions: (1) rinsing the mouth with a carbohydrate-electrolyte solution (CES), (2) rinsing with placebo, (3) ingestion of a CES and (4) ingestion of placebo. The total rinsed/ingested amount of the solution was set at 14ml/kg body weight. A 100mL of CES (Gatorade) contained 5,4g sucrose, 0,46g glucose, 41,7 mg Na⁺ and 12,5mg K⁺. In placebo, carbohydrates were replaced by a non-caloric sweetener. Lactate (Lactate PRO test strips) were measured at onset and after each 12,5% of the test. After each quarter of test subjects were asked to give their rate of perceived exertion using a Borg-scale.

Results: Time to complete the test was $3847s \pm 387$; $3705s \pm 308$; $3749s \pm 413$ and $3792s \pm 415$ for rinsing with placebo, rinsing with CES, ingestion of placebo and ingestion of CES respectively. A significant interaction effect was found between administration x carbohydrates ($p = 0,028$). Post-hoc analysis with a paired-sample T-test revealed that time to complete the test was significantly faster when subjects rinsed their mouth with CES compared to placebo ($p = 0,018$). It also seemed that time to complete the test was faster when subjects rinsed their mouth with CES compared with the ingestion of CES, although this difference was not significant ($p = 0,095$). Lactate concentration was $3,24 \pm 1,17$ mmol/L; $4,09 \pm 1,45$ mmol/L; $3,70 \pm 1,32$ mmol/L and $3,88 \pm 1,51$ mmol/L for rinsing with placebo, rinsing with CES, ingestion of placebo and ingestion of CES respectively. Rate of perceived exertion was $15,5 \pm 1,7$; $15,4 \pm 1,4$; $15,2 \pm 1,4$ and $15,2 \pm 1,5$ for rinsing with placebo, rinsing with CES, ingestion of placebo and ingestion of CES respectively.

Conclusion: The observation that the time to complete the test was ~2.5 min faster when subjects rinsed their mouth with CES compared with placebo is in agreement with the findings of Carter and colleagues (2004). We therefore confirm the existence of a central effect on exercise performance that is initiated by carbohydrate receptors in the mouth cavity. The interesting finding of this present study is that rinsing the mouth but not ingestion with CES resulted in improved performance. This indicates that the ergogenic effect of the presence of carbohydrates in the mouth is reversed by swallowing the drink, possibly due to the resulting disadvantageous redistribution of blood flow to the gut.

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Plyometric training effects on anthropometric features, explosive strength and kicking speed in female soccer players

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Introduction: In soccer, where numerous bursts of explosive activity are required, explosive strength constitutes a determinant factor for high-level performance (2,3). Plyometric training has been recommended for sports that rely on generation of high power output (1). The purpose of the present study was to determine the effects of a plyometric training in anthropometric features, explosive strength and kicking speed in female players.

Methods: Twenty female soccer players (Spanish National Women's First Division) participated in the present study divided in two groups: Control Group (CG) (23,0 ± 3,2 years; 56,9 ± 7,4 kg; 161,5 ± 5,4 cm) and Plyometric Group PG (22,8 ± 2,1 years; 58,5 ± 9,3 kg; 163,0 ± 7,0 cm). They normally trained on average ten hours a week excluding the game. During the experimental phase (12 weeks) CG subjects went on with their standard soccer physical conditioning program while PG changed it by a plyometric program, that took place three days a week (36 sessions) with one day rest in between. The training regimen was based on three different exercises: jump over hurdles, drop jumps in stands and horizontal jumps. Training sessions were performed on a hard synthetic floor and the number of jumps per session was the same each week. After the end of the program subjects of PG went on with their normal soccer training with members of CG. All the players were tested on four separate times: T1 (one week before starting training), T2 (after six weeks of training), T3 (one week after the end of the training period) and T4 (four weeks after the end of the training period, detraining). Height, body mass, six skinfolds, wrist and femur diameters, countermovement jump, drop jump and kicking speed with dominant and non-dominant leg were measured for each player. Student t-test was carried out to determine differences among the two groups' initial values. Training related effects were assessed using two-way analysis of variance with repeated measures (group x time). When a significant F-value was achieved by means of Wilks lambda, Tukey post-hoc procedures were performed to located the pairwise differences.

Results: Prior to starting training (T1) there were no differences between groups in the variables analysed. No significant differences in anthropometric features were reflected in any group through the different assessments. However, significant increases ($p < 0.05$) in CMJ (8,54%) and DJ (13,23%) were observed in PG after 6 weeks of plyometric training (T2) and in kicking speed with both dominant (11,75%) and non-dominant (13,07%) leg after 12 weeks (T3). No significant differences in explosive strength or kicking speed were recorded in CG throughout the study. After the specific 4-week reduced training period (T4), there were no significant differences in explosive strength and kicking speed in PG, so the achievements did not decrease during the subsequent reduced training period ($p < 0.05$).

Conclusions: To conclude, 12 weeks of specific plyometric training revealed a significant increase in explosive strength of lower limbs and in kicking speed in female soccer players. Nevertheless it had no influence in anthropometric features. On the other hand, 4 weeks of reduced training did not alter any performances in this population.

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Limb preference in spontaneous human gait transitions

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Introduction: To move from one place to the other humans mainly walk or run. Walking is chosen for at lower speeds whereas running occurs at higher speeds. When increasing speed, humans switch from a double stance phase to a flight phase, or from walking to running. Walking and running are two symmetrical gait patterns by which means that the left and right limb perform the same actions however with a 50% temporal phasing (Getchell and Whittall, 2004). The walk-to-run transition stride however is asymmetrical by definition as it consists of one walking and one running step. This reminds of a galloping frequency, characterized by the dominant leg leading. As an energy-input is necessary to realize the transition and the transition stride is asymmetrical, it does not seem inconceivable that humans have a preferred leg to execute the transition step (the first step with a flight phase) (Segers et al., 2007). Until now no studies focussed on the relationship between laterality and transition. Nevertheless this knowledge can enhance the insight in the neuromotor control of human locomotion. Limb dominance is related to the notion that the two hemispheres of the brain are functionally different. The preferred or dominant limb is the mobilizing and/or manipulating foot, whereas the non-preferred limb contributes to support (Sadeghi et al., 2000). We hypothesize that humans have a limb preference to realize the walk-to-run transition. Therefore we examined effects of shooting preference and balancing skills on spontaneous gait transitions.

Methods: 81 subjects performed 3 spontaneous gait transitions. They were instructed to increase their walking speed till the moment it would be more comfortable for them to run. This means that subjects were able to adapt their acceleration freely from standing still to WRT. The transition trials were filmed at 50 Hz with two consumer video cameras. One camera focussed on the starting leg (the first step in the acceleration). The other camera was placed in a frontal plane to follow the transition trial and to define the transition step. The manipulation leg was defined as the shooting leg in soccer. The subjects performed a soccer dribbling exercise ending with a shot on a small target. The latter was filmed at 50Hz. The support leg was defined as the preferred leg in a balance task (Flamingo test). A one sample T-test was used to examine the occurrence of side preference in the realization of the WRT.

Results:

	Shot	Balance	Start	WRT
Population n=81				
Left	14.93%	48.05%	31.62%	50.00%
Right	85.07%	51.95%	68.38%	50.00%
Men n=50				
Left	19.51%	53.19%	38.19%	47.22%
Right	80.49%	46.81%	61.81%	52.78%
Women n=31				
Left	7.69%	40.00%	20.43%	52.69%
Right	92.31%	60.00%	79.57%	47.31%

Table 1. Limb dominance

The percentages represent the mean of all subjects.

For the shot foot, the start foot and the transition foot the score of each individual subject was a percentage of all examined trials.

The balance test was done only once.

There is no side preference in the realization of the spontaneous WRT. There is a preference to start the WRT acceleration with the right leg (df=77; t= -3.889, p=.000). Right leg dominant subjects (shot right) did not have limb preference to realize transition (df=57, t=-0.560; p=.578) but did start the acceleration with their manipulating limb (df=57, t=4.653; p=.000). Left leg dominant subjects (shot left) had a limb preference neither to realize the WRT (df=16; t=.108, p=.915) neither to start the acceleration (df=16; t=-.085, p=.933). One of the explanations for not finding limb preference during the transition stride, could be the protocol to evoke spontaneous gait transitions. In literature, transition is studied during constant acceleration on a treadmill (Segers et al., 2007) or at constant speeds nearby transition speed that are increased with discrete steps (Hreljac, 1995). As a task becomes harder, the dominant limb usually gains the upper hand. The spontaneous character and the possibility to adapt progression speed as the subjects prefer, probably simplify the task when compared to accelerations on a treadmill. Future research should also include laterality questionnaires to scale footedness and handedness. By that means a more comprehensive view can be obtained of the laterality aspect. More-over the set-up currently applied could be improved, which might affect the observed acceleration profile and consequently the use of the dominant leg. In conclusion, there is no limb preference in the realization of spontaneous walk-to-run transitions

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Physical activity promotion through the Internet: RCT of a tailored intervention for adults

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PURPOSE: To evaluate the effectiveness of an interactive physical activity (PA) promotion website, with tailored PA advice as the key element, in real-life conditions.

METHODS: Healthy adults (n=434), aged 20-55 years, were randomised in 3 conditions. Group 1 could visit the website at baseline and received tailored advice once. Group 2 was stimulated to use the website repeatedly and had the opportunity to receive tailored PA advice twice. Group 3 was a no treatment control group. PA levels were measured at baseline and at 6-month, using a computerised version of the long International Physical Activity Questionnaire (IPAQ).

RESULTS: At 6-month, 285 participants completed the post-test questionnaire. Repeated measures ANOVA's were used to examine differences between groups. Significant time by group interaction effects were found for active transportation ($F(2,282)=5.457$; $p<0.01$) leisure time PA ($F(2,282)=3.491$; $p<0.05$) and minutes sitting on weekdays ($F(2,281)=3.625$; $p<0.05$); in favour of both intervention groups. Subgroup analyses focusing on participants not meeting the PA recommendation at baseline (accumulate at least 30 minutes of moderate-intensity PA on most days of the week), showed significantly greater increases in total PA ($F(2,173)=4.007$; $p<0.05$), active transportation ($F(2,173)=4.432$; $p<0.05$) and household activities ($F(2,173)=3.726$; $p<0.05$) as well as a decrease in time spent sitting on weekdays ($F(2,173)=3.253$; $p<0.05$) in the intervention groups when compared to the control group. No significant differences were observed between the two intervention groups.

CONCLUSION: The interactive website, with tailored PA advice was able to enhance PA scores in healthy adults in comparison with a control group. These results suggest that website delivered PA interventions can be effective and feasible. More research is needed on optimal intervening intensity as no differences were observed between intervention groups. Comparable with other health promoting trials implemented through the Internet, attrition was high (35%); effective methods for decreasing attrition need to be developed.

The contribution of visual information to human brake behaviour

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Introduction: To be successful in the confusion of daily traffic, visual information about the time available before making contact with the obstacle (time to contact or TTC) is necessary, but there are several ways of obtaining this information. As an object approaches, its retinal projection increases, hence TTC can be obtained directly from the inverse of the rate of dilation on the retina of the monocular eye by tau dot (1). In a more indirect way, perceived distance and velocity parameters can be combined to obtain TTC ($TTC = D_{\text{perceived}} / V_{\text{perceived}}$). The latter assumption has two implications. First, because depth perception by which distance is perceived is more accurate under binocular than under monocular vision (2), less accurate brake behaviour is expected in a braking task under monocular vision. Second, as the use of peripheral vision contributes to the perception of the drivers' velocity (3), a restriction of peripheral vision mortgage appropriate brake behaviour. The purpose of present experiments was to investigate brake behaviour under monocular/binocular and central/peripheral vision.

Methods: In the first experiment 13 female participants drove a go-cart along a linear trajectory at a speed of approximately 11 km/h. They could start braking at 4, 7 or 10 meters from a target vehicle when a red lamp on the rear of this vehicle was lit. The momentaneous position of the go-cart was measured at 200Hz with a laser (Noptel CMP2-30). Several distance and time parameters throughout the braking process were calculated as principal dependent variables. The same braking task was executed in a second experiment by 17 male participants. Participants wore specially taped safety goggles in order to create 3 different visual conditions: normal vision (NV), central vision restricted to an angle of 10° (CV), and central vision (10°) + 10° restricted peripheral vision (CPV). ANOVA's with repeated measures were undertaken on all dependent variables.

Results: As expected given the set-up, a significant main effect of distance was found on all dependent variables in both experiments ($p < .01$). The greater the distance in which participants were allowed to brake, the more time and distance was used. No significant differences were found between the monocular and the binocular condition in the first experiment. In the second experiment, several significant interactions were apparent, with an overall increase of difference between the visual conditions when the distance from which braking was allowed, increased. Under restricted vision, TTC at the onset of braking was perceived sooner ($p < .01$), the participants took more time braking ($p = .056$) and stopped at a greater distance ($p < .01$), mainly in the longest distance-condition.

Conclusions: Out of the data from the first experiment, it seems that monocular information of the optical variable tau dot can play an important role in the visual control of braking. The second experiment shows evidence that when there is enough time available for braking, the human system seems to use information out of peripheral vision in order to brake adequately. When put the two experiments together, evidence was found for directly as well as indirectly visually guided brake behaviour. It seems that humans are capable to use the visual information which is available at that particular moment in order to brake appropriately.

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Correlates of extra-curricular school sports participation among Flemish adolescents

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Purpose: To determine correlates of extra-curricular school sports participation among Flemish adolescents from 18 secondary schools. The mandatory physical education program was therefore not included in the evaluation.

Methods: A randomized sample of 1628 Flemish adolescents (732 girls and 896 boys) from grades 6 - 12 was surveyed at school for demographic factors, overall physical activity levels, levels of school-related sports participation, social support, perceived benefits and barriers, and sports of preference. Total sample and separate subgroup analyses (for both genders, each grade group, and for the sedentary group) were performed. Correlates of extra-curricular school sports participation were identified in logistic regression analyses.

Results: A percentage of 40.7 of the total sample reported to participate in extra-curricular sports at school. Demographic analyses of the reported data showed a significant main gender-effect in favor of boys ($p < 0,001$; $F = 49,316$). There was also a significant main effect for grade group with adolescents in the lower grades reporting more participation than those in higher grades ($p < 0,001$; $F = 23,402$). Social support of friends was identified as a positive correlate in the total sample ($p < 0,001$; OR: 2,667) as well as the subgroup analyses. The perceived benefit of competition was also a positive correlate in the total sample ($p = 0,001$; OR: 1,658) and in boys only ($p < 0,001$; OR: 2,161). Adolescents from grades 6 and 7 reported more participation when they lived more than 5km from school ($p < 0,001$; OR: 2,423). Those from grades 8 and 9 who showed 'interest' in participation were less likely to report actual participation ($p = 0,007$; OR: 0,487). Adolescents from grades 10 and 11 who reported more 'sports participation outside school' were more likely to also participate in extra-curricular school sports ($p = 0,008$; OR: 2,410). Finally, girls' sports of preference were dance (61,2%), fitness activities (53,7%) and badminton (50,4%), while for boys these included soccer (61,3%), mountainbiking (41,9%) and also badminton (40,1%).

Conclusions: Despite the study's limitations, the identified correlates should be taken into account by schools when organizing extra-curricular school sports, as they could contribute to an increase in adolescents' sports participation.

A morphological classification for toddlers

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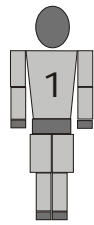
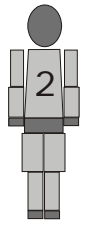
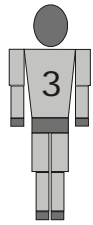
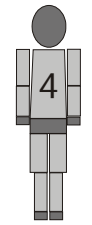
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Introduction: Existing methods for somatotyping are inappropriate for children under 6 years due to the lack of reference material. The goal of this project is to create a similar morphological classification for toddlers. This classification could be used to study the effect of morphology on gait in toddlers

Material and methods: For 100 typically developing children (15-36 months), according to the Denver developing and screening test, data are available on body mass, length, BMI, head circumference, length of the thorax, upper arm, forearm, thigh and leg and width of the shoulders, pelvis, upper arm, forearm, thigh and leg. The physique of a child is described in detail by these parameters. To define the variance in physique between the children, a principal component analysis (PCA) is performed. The newly composed variables were used to create a morphological classification.

Results: PCA resulted in three newly composed variables. Main components of the first variable, which explains 35.1% of the variance between the children, are body mass, body length, head circumference, length of the thorax, upper arm, thigh and leg. BMI, width of the pelvis, forearm, thigh and leg compose the second variable. This variable accounts for 22.0% of the variance. The third variable, which explains another 15.3% of the variance, is composed by the width of the shoulders and upper arm and length of the forearm. The morphological classification is a combination of the second and third variable. The first variable is not included in the classification because it reflects changes in morphology due to age. In table 1 pictures of the different morphotypes are presented. By measuring BMI, width of the pelvis, forearm, thigh and leg and the width of the shoulders and upper arm and length of the forearm the morphotype of a child can be specified.

Table 1: Morphological classification

				
Variable 2	High BMI Broad pelvis Broad forearms Broad thighs Broad legs	High BMI Broad pelvis Broad forearms Broad thighs Broad legs	Low BMI Narrow pelvis Narrow forearms Narrow thighs Narrow legs	Low BMI Narrow pelvis Narrow forearms Narrow thighs Narrow legs
Variable 3	Broad shoulders Broad upper arms Long forearms	Narrow shoulders Narrow upper arms Short forearms	Broad shoulders Broad upper arms Long forearms	Narrow shoulders Narrow upper arms Short forearms

Conclusions: With this morphological classification the morphotype of children between 15 and 36 months can be specified. In further research this classification will be used to study the effect of morphology on gait in toddlers.

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Shortening induced force depression is related to force recovery after active shortening in intact mice soleus muscle

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Introduction. The steady-state isometric force after active muscle shortening is lower than isometric force at the same length without contraction history. The mechanism of this force depression (FD) is unknown but stiffness related disorganization of filaments after shortening is one of the hypotheses put forward (1). Recently Burton *et al.* (2) concluded that the force recovery after active shortening is related to the strain of cross-bridges. Therefore we hypothesized that FD is related to parameters of the recovery phase.

Methods. We varied the amount of FD by applying two different shortening amplitudes (0.6 mm and 1.2 mm) to incubated electrically stimulated mice soleus muscle ($n=12$) and analyzed the force recovery phase during the transition from end-dynamic (ED) to steady-state isometric (SS) force at the same end length (L_0). SS was compared to the force of a pure isometric contraction (IC) of the same duration (5 s) and at the same length. Thus FD is defined as the difference between IC and SS, in percent of IC. Student's *t*-tests for repeated measurements were used to test differences ($p<0.05$). Pearson correlation was used to test a relation between variables. Results are presented as means \pm SD.

Results. In agreement with previous studies FD was higher after 1.2 mm shortening compared to 0.6 mm shortening ($10.8\% \pm 0.7$ and $6.8\% \pm 0.7$ respectively). The amount of recoverable force (difference between SS and ED) was $59.6 \text{ mN} \pm 4.8$ after 1.2 mm shortening and reduced to $50.8 \text{ mN} \pm 4.1$ after 0.6 mm shortening. The force recovery phase was well described by a double exponential function of time (mean error $0.06\% \pm 0.006$). The rate constants of both the fast ($18.4 \text{ s}^{-1} \pm 2.3$) and the slow ($3.1 \text{ s}^{-1} \pm 0.3$) component of the recovery phase decreased with shortening amplitude to values of $11.8 \text{ s}^{-1} \pm 1.6$ and $2.4 \text{ s}^{-1} \pm 0.3$ respectively. The relative contribution of the slow phase decreased from $60.3\% \pm 4.1$ to $54.9\% \pm 3.8$ with increasing amplitude. FD did not correlate with the time constants nor with the relative contribution of the two phases. However, a correlation of 0.93 was found between FD and the slow/fast ratio of the rate constants.

Conclusion. We conclude that the incomplete force recovery after shortening (force depression) is related to the ratio of the rate constants of the slow and fast component during recovery. According to the model of Burton *et al.* (2) this suggests that FD results from the attachment of cross-bridges at high strain relative to the attachment at low strain.

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Combined linkage peak fine-mapping strategy identifies locus for muscle strength on chromosome 12

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Given the increasing use of genome-wide linkage scans for complex traits, fine-mapping of the resulting linkage peaks becomes an important challenge. Fine-mapping techniques mostly focus on refining linkage peaks by genotyping additional markers. However, no selection regarding e.g. location or functionality is done on the markers, resulting in a less than ideal approach for a follow-up association analysis using the same marker data. In an alternative strategy, (association) analyses are restricted to polymorphisms within positional candidate genes. The latter approach does not allow additional linkage analyses and is only appropriate when focus is on a limited number of candidate genes. To overcome the disadvantages of both strategies, we propose a combined strategy by covering the whole linkage region with additional markers, selected based on their location in or near positional candidate genes. Refining of the linkage peak and follow-up association analyses can then be performed using the same marker data.

Selection of candidate genes is based on a gene prioritisation procedure based on similarity to genes known to influence the trait of interest using a bioinformatics approach (ENDEAVOUR). TagSNPs and coding SNPs within the candidate genes are determined using CEPH genotypes within Haploview and SNP selection is based on functionality, initial priority ranking of the gene, minor allele frequency and budgetary and genotyping platform technological criteria.

Analyses are performed using linkage and association analyses and combined family-based association analysis. Application of this strategy on a previously determined linkage peak ($\pm 90\text{cM}$) for isometric and dynamic knee muscle strength on chromosome 12 resulted in the identification of a new locus for muscle strength. Linkage analyses on selected strength measurements resulted in maximal LOD-scores ranging from 0.30 to 2.05 and follow-up family-based association analyses identified a marker locus with p-values for association between 0.000044 and 0.43. This SNP is located in a gene that presumably has a role in the myostatin signalling pathway.

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