

10^{de} Symposium van de Vereniging voor Kinesiologie

50 years of Physical Activity, Physical Fitness and Health in Belgium

Donderdag, 22 september 2005, Leuven

Robert Malina (Tarleton State University, USA)

Longitudinal Growth Studies: A Historical Overview

José António Maia (University of Porto, Portugal)

Challenges and promises in physical activity research

Gaston Beunen (KULeuven)

Physical Activity, Fitness and Health: State of the Art in 2005

Romain Meeusen (VUBrussel)

Recent findings on thermoregulation during exercise

Benedicte Deforche (UGent)

Fysieke activiteit en fitheid bij jongeren met obesitas

Ann Hallemans (UAntwerpen)

De eerste snelle ontwikkelingsfase van stappen

Siska Van Houtte (KULeuven)

Respiratoire spiertraining bij een acute dwarslesie

Voorwoord

De Vereniging voor Kinesiologie (VK) organiseert dit jaar reeds voor de 10^{de} keer het jaarlijkse VK-symposium. Het thema luidt “50 years of Physical Activity, Physical Fitness and Health in Belgium”. Niet toevallig zijn de mannen die als proefpersonen deelnamen aan de eerste grote groeistudie in Vlaanderen dit jaar 50 jaar geworden. Evenmin toeval is dat deze eerste groeistudie de start betekende voor de onderzoeksloopbaan van Gaston Beunen, die 10 jaar geleden mede-oprichter en eerste voorzitter werd van de Vereniging voor Kinesiologie. Deze jubileumeditie van het VK-symposium wordt georganiseerd naar aanleiding van het emeritaat van Gaston Beunen, en bevat gastlezingen van eminente buitenlandse onderzoekers waarmee hij in zijn rijkgevulde loopbaan heeft samengewerkt. Het symposium wordt georganiseerd onder de OVUNOLO koepel met de steun van de Vlaamse Trainerschool (VTS-BLOSO).

Wij zijn verheugd ook dit jaar een groot aantal deelnemers te mogen verwelkomen. Wij heten u van harte welkom op de campus van de Faculteit Bewegings- en Revalidatiewetenschappen en hopen dat het voor iedereen een stimulerende en leerrijke dag wordt.

Dan Daly
Wim Derave

Programma

- 9.00u Registratie en onthaal
- 9.40u **Verwelkoming en opening**
Daniel Daly, Voorzitter Vereniging voor Kinesiologie
- 9.45u **Longitudinal Growth Studies: A Historical Overview**
Robert Malina (Tarleton State University, USA)
- 10.15u **Physical Activity, Fitness and Health: State of the Art in 2005**
Gaston Beunen (KULeuven)
- 10.40u Koffiepauze
- 11.00u **Presentaties VK-prijs voor jonge onderzoekers**
Posters in competitie voor de VK-prijs (enkel licentiaten/masters afgestudeerd in 2005) geven een korte mondelinge presentatie in 5 minuten aan de hand van enkele powerpoint-slides voor het volledige publiek in het auditorium. De jury en het publiek kunnen vragen stellen. Tijdens de lunchpauze zijn de deelnemers aanwezig bij hun posters.
Zie pagina 15 voor een overzicht van de deelnemers en hun abstracts
- 13.45u **Challenges and promises in physical activity research.**
José António Maia (University of Porto, Portugal)
- 14.10u **Recent findings on thermoregulation during exercise**
Romain Meeusen (VUBrussel)
- 14.35u Koffiepauze
- 14.50u **Proclamatie VK-prijs voor jonge onderzoekers + aansluitend Algemene Ledenvergadering VK**
- 15.20u Voorstelling recente doctoraten (elk 20 min)
Fysieke activiteit en fitheid bij jongeren met overgewicht en obesitas
Benedicte Deforche (UGent)
De eerste snelle ontwikkelingsfase van stappen: een dilemma tussen evenwicht en impulsie?
Ann Hallems (UAntwerpen)
Respiratoire spiertraining bij een acute dwarslesie
Siska Van Houtte (KULeuven)
- 16.20u Receptie

De Vereniging voor Kinesiologie

De VK: Een terugblik

Op **12 maart 1996** werd een nieuwe vereniging opgericht in Vlaanderen: De "Vereniging voor Kinesiologie en Sportwetenschappen -V.K.S.W.". De volgende bestuursleden werden hierbij aangeduid : Gaston Beunen (Katholieke Universiteit Leuven) als voorzitter, Jan Borms (Vrije Universiteit Brussel), Peter Aerts (Universiteit Antwerpen) en Dirk De Clercq (Universiteit Gent).

Het doel van de Vereniging was -en is nog steeds- om een forum te bieden aan alle Vlaamse Kinesiologen en Sportwetenschappers die actief zijn in het onderzoek betreffende de mens in beweging. Aangezien dit een multi-disciplinair gebied is, werden de positieve zowel als de gedragswetenschappen opgenomen om communicatie te bevorderen tussen het groeiende aantal sub-disciplines.

In de daarop volgende tien jaar is de naam van de vereniging gewijzigd naar het kortere 'Vereniging voor Kinesiologie' en gaf Gaston Beunen de fakkel van het voorzitterschap door aan Jan Borms (VUB, 1997-2000), Dirk De Clercq (UGent, 2000-2002) en Dan Daly (KULeuven, vanaf 2002).

De voornaamste doelstelling van de vereniging is de jaarlijkse organisatie van een ééndaags symposium, dat afwisselend georganiseerd wordt in Antwerpen, Gent, Brussel of Leuven. Deze symposia zijn steeds een succes geweest zowel in kwantiteit (tussen 50 en 150 deelnemers) als kwaliteit. Volgend jaar zal het symposium plaatsvinden in Antwerpen.

Tien jaar VK-symposia op een rij:

"50 years of physical activity, fitness and health in Belgium", 22 september 2005, **Leuven**

"Van wetenschap tot medailles", 5 november 2004, **Gent**

"Ouderen en bewegen: kinesiologie op leeftijd", 22 november 2003, **Brussel**

"Locomotie", 29 november 2002, **Leuven**

"Sport in de begeleiding van jonge topsporters", 30 november 2001, **Gent**

"Motorische controle en ontwikkeling, motorisch leren", 6 december 2000, **Antwerpen**

"Fysieke activiteit in de preventieve gezondheidszorg", 8 december 1999, **Leuven**

"Geslachtsverschillen en kinesiologie", 10 december 1998, **Gent**

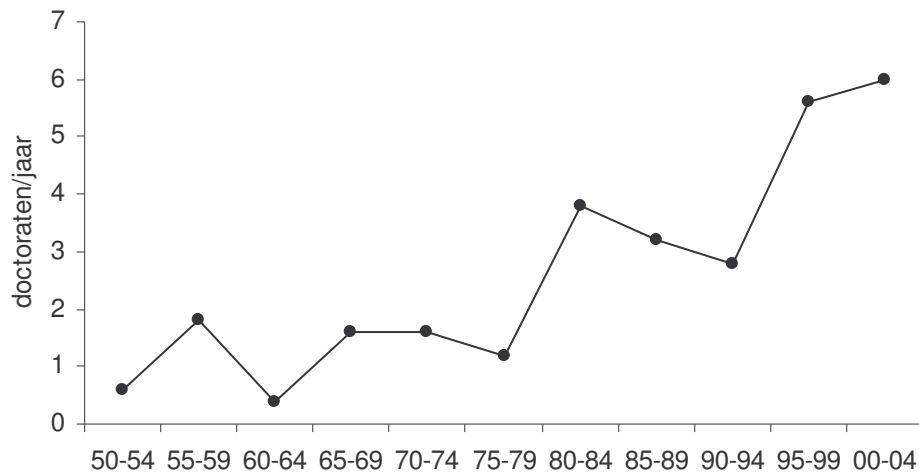
"Lichamelijke opvoeding: quo vadis?", 11 december 1997, **Brussel**

"Van Bewegen tot Beweging", 12 december 1996, **Antwerpen**

Naast de jaarlijkse symposia brengt de VK ook halfjaarlijks een nieuwsbrief uit en onderhoudt ze een handige website (<http://webhost.ua.ac.be/kine/>).

De VK: Een vooruitblik

De bewegingswetenschappen zijn in Vlaanderen in volle expansie. Steeds meer jongeren kiezen vandaag voor een doctoraat in bewegings- of revalidatiewetenschappen. Ter illustratie: onderstaande figuur toont de stijgende tendens in het jaarlijks aantal doctoraten aan de Faculteit Bewegings- en Revalidatiewetenschappen (KULeuven). Een gelijkaardige groei speelt zich af in de andere Vlaamse universiteiten.



Figuur: Jaarlijks aantal doctoraten LO en REKI aan de KULeuven in periodes van 5 jaar sinds 1950

Deze groeiende populatie bewegingswetenschappers in Vlaanderen toont aan dat kinesiologie een belangrijke, aantrekkelijke en volwaardige wetenschappelijke discipline is geworden. Deze groei betekent echter ook een uitdaging. Het spreekt voor zich dat de 80 wetenschappers die de afgelopen 10 jaar een kinesologisch doctoraat behaalden in Vlaanderen niet allemaal zullen kunnen doorgroeien in een academische loopbaan, zoals dit vroeger voor het merendeel van de gedoctoreerden het geval is. Meer en meer moet nu uitgekeken worden naar loopbaanmogelijkheden buiten het hoger onderwijs, waarbij meteen de vraag rijst wat hierbij de meerwaarde is van het doctoraatsdiploma. De Vereniging voor Kinesiologie ziet deze problematiek als een belangrijk werkpunt voor de toekomst en hoopt hierover samen met u een debat te kunnen voeren.

Symposium Abstracts

Lezingen op uitnodiging



Longitudinal Growth Studies: Historical Perspective.

Robert M. Malina

Tarleton State University, Stephenville, TX, USA

The longitudinal study of human growth, maturation and performance has a long history in a variety of disciplines – psychology, medicine, human biology, biological anthropology, and physical education and the sport sciences. The longitudinal study of physical activity, in contrast, has more recent roots in physical education and the sport sciences and public health. This paper offers an historical perspective of longitudinal studies that have considered growth, maturation, performance and physical activity. Major longitudinal studies began in the late 1920s-early 1930s in the United States and focused largely on growth, maturation and behavior, and with the exception of the Oakland component of the University of California at Berkeley studies, did not include measures of performance. The same was true in European longitudinal studies, which largely emphasized growth and maturation and clinical application. Studies which included major performance and activity components emerged in the 1960s and 1970s. Longitudinal studies of risk factors for cardiovascular disease also emerged at this time, but did not include a physical activity component. The 1980s and 1990s saw the emergence of longitudinal studies with a major physical activity component, largely in the context of cardiovascular disease and tracking, and more recently in the context of bone mineral accrual. At present, a number of the longitudinal studies have a major follow-up component at various ages in adulthood including measures of physical activity and fitness, health status and specific risk factors (cardiovascular, overweight-obesity, metabolic syndrome), risk of morbidity and mortality, and probably moving towards the precursors of longevity. Longitudinal studies, of course, have limitations; given logistical problems, most are actually mixed-longitudinal. Many have deviated from and/or have been modified from their original purposes in light of limited funding sources and changing priorities especially in public health.

Physical Activity, Fitness and health: State of the Art in 2005.

Gaston Beunen

*Department of Biomedical Kinesiology, Faculty of Kinesiology and Rehabilitation Sciences,
K.U.Leuven, Belgium.*

Within the context of 50 years of Physical Activity, Physical Fitness and health in Belgium it seems appropriate to review the contributions that have been made over the past decades, with special emphasis on the projects conducted at our faculty. Subsequently, some of the most recent trends in physical activity/fitness research will be briefly summarized. Already in 1919, the University of Ghent was the first in the world to deliver doctoral degrees. But it was only in the mid-sixties that large epidemiological studies in fitness started at the Vrije Universiteit Brussel and at the K.U.Leuven. We have to keep in mind that the definition of physical fitness has evolved dramatically over time: first it referred to body dimensions and proportions, subsequently to general motor fitness, later multidimensional fitness, and finally health and performance related fitness (Park, s.d.). In the Leuven Growth Study of Belgian boys we first developed a test battery which formed the basis of the Eurofit test and the fitness tests included in the Amsterdam Growth, Health and Fitness Study. Based on more than 20.000 observations for boys and more than 9.000 observations for girls (Leuven growth Study of Flemish Girls) reference values were constructed for somatic dimensions, fitness and sports participation. It was also demonstrated that, as for most somatic dimensions, several fitness characteristics show a clear adolescent growth spurt, after the growth spurt in size. Early maturing boys and girls show highly significant greater body dimensions than late maturing boys and girls. In boys, fitness levels are higher for most characteristics especially around the growth spurt. There are also associations between fitness and socio-cultural indicators. Boys who are active during early adolescence do not differ in size from those who are inactive. The active tend to have less adiposity and higher muscular endurance than the inactive. The Leuven Boys Growth Study was extended and became the Leuven Longitudinal Study on Lifestyle, Fitness, and Health, and most recently the Flanders Longitudinal Offspring Study. In these projects, we followed the boys into adulthood (30-35-40 years and at 47 years including partners and children), and also the girls were followed into adulthood, again investigating the subjects their partners and children. We demonstrated that boys who are inactive in late adolescence tend to remain inactive at later ages, and adolescent boys who are overweight have a 6.5 times higher risk than non-overweight adolescents to become overweight adults (40years). Furthermore, physical activity levels in adulthood (40years) are associated with fitness, somatic dimensions, sports participation and socio-economic characteristics of the family. In 2002 the Policy research Centre, Sport, Physical Activity and Health was initiated and funded by the Flemish Government. A nationwide survey indicates a high prevalence of overweight, high blood pressure, total cholesterol, LDL, and inactivity. Most recently the 1995 recommendations were challenged by the IOM and EURODIET. The IOM recommends now 60 minutes of moderate physical activity all days of the week, and EURODIET even 60-80 minutes. These recommendations are mainly based on the concern to keep an energy balance for preventing overweight and obesity. In 2001 a symposium was devoted to the dose-response relationship between physical activity, mortality and morbidity. Reviews were published in MSSE. Most recently, Strong and Malina and co-workers (2005) published recommendation for children and adolescents based on a review of more than 850 studies. They recommend 60 minutes of at least moderate physical activity every day of the week. Finally, several studies indicate that besides physical activity, aerobic fitness is a separate factor associated with mortality and morbidity.

Challenges and promises in physical activity research

José António R. Maia

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The purpose of this “conference” is to discuss some relevant issues related to different aspects of physical activity research in the fields of applied epidemiology, genetics, data analysis and health. Within this large frame work, several issues will be addressed:

1. The very basic definition of physical activity and its operational difficulties
2. The problem of distinguishing levels and patterns of physical activity
3. The aspects of descriptive and analytical epidemiology devotes to physical activity research (determinants, changes in mean values, decline or not)
4. Tracking versus modelling change of physical activity levels and its predictors
5. Genetic research with animals and humans (twins and nuclear families)
6. Some thoughts about future research in physical activity epidemiology (with or without a focus on genetic issues)

Recent Findings on Thermoregulation during Exercise

Romain Meeusen

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When exercise is performed in high ambient temperatures, the development of central fatigue appears to be accelerated, leading to a loss of drive to continue. This may explain why individuals tend to cease exercise long before muscle glycogen stores reach levels thought to be limiting (Parkin et al., 1999). Capacity to perform prolonged exercise is clearly impaired in high ambient temperatures (Galloway & Maughan, 1997; Parkin et al., 1999). While exercise capacity is thought to be primarily limited by thermoregulatory and fluid balance factors (Hargreaves & Febbraio, 1998), it has been suggested that the central nervous system (CNS) may become important in the development of fatigue (Meeusen & De Meirleir 1995, Meeusen et al 1997, 2001), especially when body temperature is significantly elevated (Nielsen, 1992). During prolonged exercise in the heat, exhaustion appears to coincide with the attainment of an internal body temperature of around 40.0°C (Gonzalez-Alonso et al., 1999). Hyperthermia has been proposed to accelerate the development of central fatigue during exercise, resulting in a reduction in maximal muscle activation (Nybo & Nielsen, 2001a), altered EEG brain activity (Nielsen et al., 2001) and increased perceived exertion (Nybo & Nielsen, 2001b). It is likely that this serves as a protective mechanism limiting further heat production when body temperature reaches levels that may be detrimental to the organism as a whole, but the neurobiological mechanisms for these responses are not clear at present.

As DA and NA have been implicated in arousal, motivation, reinforcement and reward, the control of motor behaviour and mechanisms of addiction we recently explored the possible interaction between high ambient temperature, and possible underlying neurotransmitter drive during exercise, using a dual DA/NA reuptake inhibitor (Watson et al., 2005a). Subjects ingested either a placebo or bupropion (Zyban), prior to exercise in temperate (18°C) or warm (30°C) conditions. Two important findings arise from this study: 1) subjects completed a pre-loaded TT 9% faster when bupropion was taken before exercise in a warm environment compared to a placebo treatment. This ergogenic effect was not apparent at 18°C. 2) Seven (of 9) subjects in the heat attained core temperatures equal to, or greater than, 40°C in the bupropion trial, compared to only two during the placebo trial. It is possible that this drug may dampen or override inhibitory signals arising from the CNS to cease exercise due to hyperthermia, and enable an individual to continue to maintain a high power output. It is important to note, however, that this response appeared to occur with the same perception of effort and thermal stress reported during the placebo trial, and may potentially increase the risk of developing heat illness. Recently we found similar results in animal experiments indicating that the subtle balance between heat production and heat dissipation could be disturbed (Hasegawa et al 2005). These data suggest that catecholaminergic neurotransmission may act as an important neurobiological mediator of fatigue under conditions of heat stress.

Until recently there have been few studies to focus directly on the relationship between brain neurotransmission, thermoregulation and exercise performance/exercise capacity in a warm environment. Therefore, further research, including both pharmacological and nutritional manipulation are necessary to elucidate the role of specific neurotransmitter functions during exercise in the heat.

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Physical Activity and Fitness in Overweight and Obese Youngsters

Benedicte Deforche

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The prevalence and level of obesity in children and adolescents is rapidly increasing worldwide, also in Belgium. There is an urgent need for the development of effective programs to treat obesity in childhood and adolescence and to prevent that obese youngsters become obese adults. Sedentarity and low levels of physical activity are assumed to be important contributors to the increasing prevalence of obesity among children and adolescents. Strategies to increase physical activity are therefore one of the key elements in the treatment of obese youngsters, along with changes in eating behaviour. It is important to evaluate short and long-term effectiveness of existing programs. In addition, to be able to adapt intervention programs to the specific needs of overweight and obese youngsters, it is important to study specific characteristics of this population. Therefore the aim of this thesis was twofold. The first aim was to gain an insight into physical activity and fitness components of overweight or obese youngsters by comparing them with normal-weight counterparts. The second aim was to evaluate the effectiveness of a residential program for the treatment of obesity consisting of moderate caloric restriction in combination with physical activity and psychological support. We were particularly interested in the evolution of physical fitness, physical activity and related determinants during and after this intervention, the role of physical activity in middle long-term weight maintenance and specific strategies to improve weight maintenance after initial treatment.

The first three studies investigated differences between normal-weight and overweight or obese youngsters. It was demonstrated that obesity was detrimental to physical performance in activities requiring horizontal acceleration or vertical lifting of the body weight, but that obese subjects had greater static strength than their normal-weight peers. Overweight or obese youngsters were less engaged in self-reported sports and higher intensity physical activities than their normal-weight counterparts, but reported equal levels of leisure time physical activities. Overweight and obese youngsters had less favourable psychosocial variables related to physical activity than their normal-weight counterparts, however the prediction of physical activity from psychosocial correlates was independent of level of overweight. From the three studies evaluating the effectiveness of a moderate dietary restriction in combination with physical activity and psychological support, we could conclude that such a program is successful in improving body composition, fitness and activity levels in obese youngsters during treatment. One and a half years after initial treatment two thirds of the youngsters were still more than 10% less overweight than before initial treatment. But despite the long and successful treatment period of 10 months and the intense support by the treatment team, little lasting changes in physical activity habits were achieved. It was further demonstrated that both appropriate amounts of physical activity and low fat intake may be determinants of middle long-term weight maintenance after treatment and that one healthy behaviour can not compensate for another unhealthy behaviour. Finally, a pilot study showed that post-treatment contacts by phone and mail over a 5-month period may have beneficial effects on weight loss maintenance and (in)active behaviours after treatment.

De eerste snelle ontwikkelingsfase van stappen: een dilemma tussen evenwicht en propulsie

Ann Halleman

Labo Functionele Morfologie, Departement Biologie, Universiteit Antwerpen

Het doel van dit onderzoeksproject is vanuit biomechanisch standpunt meer inzicht te krijgen in de ontwikkeling van het alleen stappen. Dit laat toe om naast het beschrijven van de beweging ook de mechanische oorzaken van de beweging te onderzoeken. De aandacht wordt gevestigd op de eerste snelle ontwikkelingsfase van stappen waarin veel veranderingen verwacht worden in het stappatroon.

Het onderzoek is opgesplitst in twee grote luiken. Een eerste (cross-sectionele) luik tracht biomechanische determinanten te identificeren die het stappatroon van peuters onderscheiden van het volwassen gangpatroon. In een tweede longitudinale follow-up studie is de opzet te achterhalen welke biomechanische parameters belangrijke verschillen ondergaan tijdens de eerste snelle ontwikkelingsfase in de hoop meer inzicht te krijgen in mogelijke factoren die de ontwikkeling beperken of sturen.

Aan de hand van voetdrukmetingen werden de belasting van het voetoppervlak, de voetafrol en de stabiliteit tijdens de steun (aan de hand van de schommelingen van het drukcentrum) bestudeerd. Het plug-in-gait model (Vicon ®) werd gebruikt voor de berekening van stap-tijd parameters, gewrichtshoeken, netto-gewrichtsmomenten en netto-power output ter hoogte van de gewrichten. Verder werd gekeken naar de vorm en grootte van de grondreactiekrachtprofielen en het mechanisch energieverbruik tijdens stappen.

Gegevens van de kinderen werden vergeleken met data van ganganalyse bij volwassenen (10 individuen, zelfde set-up) en literatuurdata.

Verschillen tussen peuters en volwassenen in stap-tijd parameters en bewegingen van de onderste ledematen werden reeds uitvoerig beschreven in de literatuur. Wij vonden echter ook verschillen in netto-gewrichtsmomenten en netto-gewrichtspowers, mechanisch energieverbruik, voetafrol en belasting van het voetoppervlak.

Belangrijke veranderingen werden waargenomen in stap-tijd parameters, bewegingen van de onderste ledematen, voetafrol, stabiliteit tijdens de steunfase en intra-limb coördinatie bij toenemende wandelervaring. Veranderingen in netto-gewrichtsmomenten, netto-gewrichtspowers of belasting van het voetoppervlak konden niet aangetoond worden. Hoewel belangrijke veranderingen werden gezien in de schommelingen van het lichaamszwaartepunt (een afname van de laterale schommelingen en een evolutie naar een regelmatig sinusoidaal patroon in verticale schommelingen) was deze studie ook niet in staat verschillen in mechanisch energieverbruik bij peuters te identificeren.

Vele eigenschappen van het immature gangpatroon blijken gerelateerd aan een gebrekkige evenwichtscontrole. Een andere beperkende factor voor maturatie van de gang die frequent naar voor geschoven wordt is een gebrekkige coördinatie en controle van bewegingen. Relatief snelle verbeteringen in bewegingscoördinatie werden herhaaldelijk aangetoond en worden ook bevestigd door onze studie. Afwezigheid van significante veranderingen in de grootte of profielen van de netto-gewrichtsmomenten stelt ons niet in staat iets te zeggen over veranderingen in controle van de bewegingen. Mogelijk matureren posturele controle en bewegingscontrole niet gelijktijdig (aangezien verschillen in netto-gewrichtsmomenten met het profiel van volwassenen aangetoond werden tot op de leeftijd van acht jaar).

Benefits of respiratory muscle training in acute spinal cord injury

Siska Van Houtte

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Functional loss of respiratory muscles in persons with spinal cord injury leads to impaired pulmonary function. In addition, respiratory complications are responsible for 50 to 67 % of the morbidity in persons with spinal cord injury. The aim of the present study was to investigate the effects of normocapnic hyperpnea training in acute spinal cord injury (SCI, time to lesion > 6 weeks). Fourteen patients were randomized between control and experimental group. Forced vital capacity (FVC), maximal voluntary ventilation (MVV), inspiratory muscle strength (P_Imax), expiratory muscle strength (P_Emax) and respiratory endurance test (RET) were evaluated before, after 4 and 8 weeks of training and after 8 weeks follow-up. Similarly, incidence of respiratory complications was evaluated during training and follow-up. Normocapnic hyperpnea training was performed with a rebreathing bag. Patients trained 30 min, four times a week. Control patients trained at a constant ventilation of 15(4) % MVV, whereas experimental patients increased training ventilation from 30(8) % MVV towards 40(11) % MVV. MVV, P_Imax, P_Emax and duration of RET significantly improved in the experimental group compared to the control group over the training period ($p < 0.05$). Improvements in FVC tended to be different from the control group at 8 weeks of training. The Index of Pulmonary Dysfunction decreased after 4 weeks of training and respiratory complications were reported less frequently in the experimental group compared to the control group. In conclusion, normocapnic hyperpnea training in patients with SCI improved respiratory muscle strength and endurance. In addition, respiratory complications occurred less frequently after training.

Symposium Abstracts

Deelnemers VK-prijs voor jonge onderzoekers



VK-prijs voor jonge onderzoekers

Deelnemers:

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Juryleden:

Prof. Rik Gosselink, decaan FaBeR, KULeuven

Prof. Peter Aerts, Functionele Biologie, UAntwerpen

Prof. Greet Cardon, Bewegings- en sportwetenschappen, UGent

Prof. Bart Van Gheluwe, LK, VUBrussel

Prijs:

Eerste prijs: 150 €

Tweede prijs: 100 €

Derde prijs: 50 €

Validatie van een 3-daags eetdagboek: vergelijking met een 7-daags eetdagboek en een FFQ

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Introductie. Vooraleer een methode ter bepaling van de voedingsgewoonten op een bepaalde populatie wordt toegepast, dient deze methode valide verklaard te worden voor deze specifieke groep (1,2,3,5). In dit onderzoek werd een 3 –daags eetdagboek gebruikt om de voedingsgewoonten van de Vlamingen na te gaan. Een 3 –daags eetdagboek werd vroeger reeds valide verklaard en met succes toegepast in onderzoek naar voedingsgewoonten (4). Op basis van een literatuurstudie welke duidelijk maakte dat er geen methode bestaat die als “gouden standaard” beschouwd kan worden (1) en rekening houdende met ons doel en beschikbare middelen werden een 7 –daags eetdagboek en een FFQ gekozen (2,3,4,5) om het 3 –daagse eetdagboek mee te vergelijken. Omdat het gebruikte 3 –daagse eetdagboek niet eerder op de onderzochte populatie werd toegepast, is deze vergelijking een onderdeel van de validering van dit eetdagboek voor deze specifieke populatie.

Methode. Achtereenvolgens en in deze volgorde werden een FFQ, een 7 –daags eetdagboek en een 3 –daags eetdagboek ingevuld door 29 proefpersonen. De 2 eetdagboeken werden op achtereenvolgende dagen ingevuld en het 3 dagen durende eetdagboek moest precies 1 weekenddag bevatten. Steunend op de literatuur werd het 7 –daagse eetdagboek als standaard genomen. De gegevens werden geanalyseerd door de FFQCalculatorV2 en het BECEL –voedingsprogramma BINS 2.0, welke beide steunen op de Belgische en Nederlandse voedingsmiddelentabel NUBEL -1999 en NEVO -2001. Statistische tests ($p < .05$) voor de normaliteit van de parameters, de vergelijking tussen de geschatte gemiddelden en voor de berekening van de correlaties tussen de drie methoden werden toegepast (SPSS 12.0). In onze studie werd geen verschil gemaakt tussen de geslachten en hadden we geen controle over eventuele misrapporteringen.

Resultaten. Tussen de 2 eetdagboeken werd niet 1 keer een significant verschil tussen de geschatte gemiddelden van 52 voedingsparameters gevonden. Tussen de FFQ en het 7 –daagse eetdagboek werd op 35 voedingsparameters 13 keer een significant verschil tussen de gemiddelden gevonden en tussen de FFQ en het 3 –daagse eetdagboek eveneens 13 keer. Pearson en Spearman correlaties tussen de 2 eetdagboeken (.098 voor vitamine B1 tot 1.000 voor biotine) waren in het algemeen hoger dan de correlaties tussen de FFQ en het 7 –daagse eetdagboek (.055 voor vitamine D tot .828 voor het alcohol energiepercentage) en tussen de FFQ en het 3 –daagse eetdagboek (.027 voor β -caroteen tot .662 voor calcium).

Conclusie. Een significant verschil tussen de geschatte gemiddelden van de FFQ enerzijds en de 2 eetdagboeken anderzijds tezamen met een significante correlatie voor bepaalde parameters wijst voor enkele parameters op een systematisch verschil tussen de FFQ en 1 of beide eetdagboeken. Het 3 –daagse eetdagboek blijkt voldoende precieze schattingen te geven ten opzichte van het 7 –daagse eetdagboek. De enkele parameters waarvoor geen verband tussen het 3 –daagse eetdagboek en de andere methoden werd gevonden zijn vooral parameters i.v.m. energiepercentages en vitaminen. Om deze parameters te schatten is het 3 –daagse eetdagboek dus waarschijnlijk een minder aangewezen methode. Voorzichtigheid bij de interpretatie van deze resultaten is aangeraden vanwege de mogelijke systematische fouten eigen aan de methoden die de correlaties mogelijk beïnvloed hebben.

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Effects of Systematic Activity in Water on Children with Cerebral Palsy

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Introduction. Activities in water are said to contribute to decreased pain and spasms, increased ROM, strengthening of weak muscles, improvements in circulation, lung function and speech. Activities can be organised related to balance, coordination and posture as well as for re-education of paralysed muscles. Many of these problems are found in children with Cerebral Palsy (CP). In general, activities in the water are experienced as easy and relaxing, stimulating children to come to the pool and exercise and to adhere to an exercise regime. Working in water allows them to perform and learn movements that are too difficult to do on land. Despite this potential, in a review of literature (1970-1999) related to the use of aquatic therapy as an intervention for children and adolescents with neuromuscular and musculoskeletal diagnoses, most articles were case studies and descriptions of clinical practice. There is a lack of controlled studies and there remain many unanswered questions regarding hydrotherapy.¹ The goal of this study was to examine the effects of systematic sessions of physical activity in water on children with CP and related impairment from a type 4 Belgian School.

Methods. Following 6 water sessions spread over 3 months, children (10-14 yrs.) took part in water activities 2/week over a 4 week period in 50 minutes sessions. Inclusion criteria were: 1) CP, 2) Stand with assistance, 3) Travel to the pool by foot or in wheelchair. The goals were: 1) Safety and comfort in the water, 2) Independent movement with safety aids if necessary, 3) Obtain a quantity of activity as opposed to quality. No criterion for cognition was set. Information was obtained on birth date, general pathology, Verbal IQ, Performance IQ, Total IQ and their outside school activities. The following tests were then performed one time each week during the intervention period and at 7 weeks follow-up: 1) 10-m walking speed, 2) Independent progression through water (10-m swimming speed and maximal distance), 3) Hand speed, 4) Hand strength. Means and standard deviations were calculated for each testing day and a mixed model repeated analysis was used (SAS 8.02).

Results. Fourteen of the 15 children meeting the inclusion criteria completed the intervention. There was no improvement in walking speed ($p = .24$). Ten meter swimming speed improved only slightly from week 1 to the final week of the intervention. The maximum swimming distance increased from week 3 to week 4 but decreased at follow-up. Follow-up distance was nevertheless better than at week 3. Neither the non-affected hand ($p = .53$) nor the affected hand ($p = .87$) improved in handgrip strength over 4 weeks or at follow-up. For the affected hand there were no significant changes in hand speed over the course of the intervention. The hand speed did increase for the non-affected hand with significant changes from week 1 to week 2, a change due to improvements (50%) in the poorer scores in the non-affected hand (Learning effect).

Conclusions. In this pilot study important questions still needed to be answered on the pedagogical organisation of the sessions, the time investment for testing and travel to and from the pool, number of personal needed, the reactions of the children to intense physical activity. No progression in walking speed, swimming speed and handgrip strength was found after a swimming intervention of 4 weeks in children with CP. A reason for this was that the children were physical good to start with, only one child walked slower than 1.2m/s at the beginning of the study. Endurance improved in that they could swim longer. There is at first view no transfer of an intense period of activity in water to better physical performance on land. Nevertheless the children enjoyed the swimming sessions and adherence was high over an entire school year. A longer intervention period and clearer inclusion criteria, especially for cognition, are needed.

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Meten van perceptueel-cognitieve vaardigheden bij jeugdvoetballers door middel van oogbewegingsregistratie

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Inleiding: Onderzoek naar perceptueel-cognitieve vaardigheden binnen het voetbal heeft zich vooral gericht naar het vinden van verschillen tussen volwassen elitespelers en recreatieve voetballers¹. Naast het meten van anticipatievaardigheden samen met de kijkpatronen werd hierbij ook vaak gebruik gemaakt van herkenning- en reproductietesten (recognition-recall).

Methodiek: De onderzoekspopulatie (14- tot 15- jarigen) werd ingedeeld in vier groepen: een controlegroep niet-voetballers (n=22), voetballers van gewestelijk (n=23), van nationaal niveau (n=21) en een topsportgroep (n=21). In een labosituatie werden 33 offensieve voetbalsituaties op een groot scherm geprojecteerd, waarbij gevraagd werd zo snel en accuraat mogelijk motorisch en verbaal te reageren wanneer hen in de gegeven situatie de bal werd toegespeeld. De perceptueel-cognitieve vaardigheden werden gemeten aan de hand van initiatietijd, antwoordnauwkeurigheid en visuele zoekstrategieën (ASL, model 501). In dit onderzoek werden 3vs1 (middenveld / middenveld + 16m) en 4vs3 spelsituaties geanalyseerd met behulp van ANOVA voor herhaalde metingen.

Resultaten: De drie voetbalgroepen namen in vergelijking met de controlegroep sneller een beslissing (Fig. 1). Binnen de voetbalgroep hadden de nationale en de topsportgroep een snellere reactietijd dan de gewestelijke groep. Wat de spelsituatie betreft, liet elke groep de hoogste reactietijd optekenen in de 4vs3 situatie. Binnen de 3vs1 situaties was er een onderscheid tussen de situaties aan de middellijn en het 16 m-gebied.

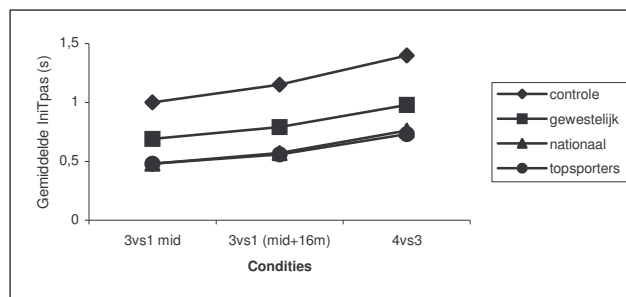


Fig. 1 Gemiddelde IniTpas (s) per groep voor de drie situaties

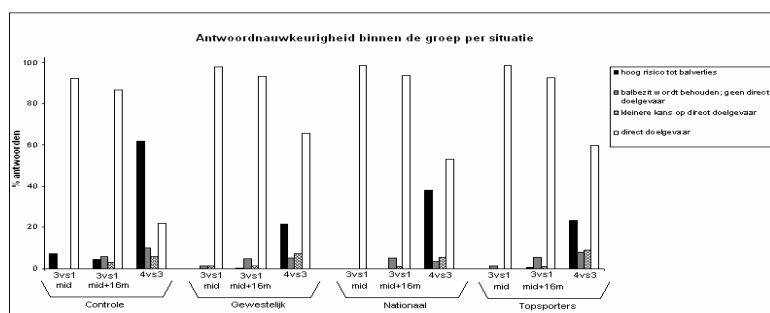


Fig. 2 Percentages van de antwoorden per situatie en per groep

Alle groepen vertoonden in de 4vs3 situaties een hogere fixatiefrequentie en een kortere fixatieduur in vergelijking met de 3vs1 situaties. Tussen de groepen traden geen betekenisvolle verschillen op.

Conclusies: Naargelang het aantal spelers in een aangeboden situatie stijgt, zien we dat de proefpersonen trager en minder accuraat gaan reageren. Bovendien worden meer fixaties gehanteerd en daalt de fixatieduur. Er moet echter ook in rekening gebracht worden dat de verhouding aanvallers/verdedigers in de aangeboden situatie een beïnvloedende factor zal zijn. Daarnaast gaan voetballers in vergelijking met niet-voetballers in elk van de situaties sneller en accurater reageren. Aangezien er geen betekenisvolle verschillen tussen de vier groepen werden gevonden voor wat betreft de kijkpatronen, kunnen we afleiden dat voetballers voetbalspecifieke informatie sneller en accurater kunnen verwerken. Verder suggereren we dat situaties aan het 16 m-gebied moeilijker op te lossen zijn dan situaties aan de middellijn aangezien er aan de 16 meter een keuzemogelijkheid bijkomt, nl. het trappen naar doel.

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De motorische ontwikkeling van dove en gehoorgestoorde kinderen. Mogelijke invloeden van een cochleair implant

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Probleemstelling. Het doel van deze studie is het onderzoeken van enerzijds de motorische ontwikkeling van dove en gehoorgestoorde kinderen die regulier onderwijs volgen en anderzijds de mogelijke invloeden van een cochleair implant op de motoriek en meer specifiek het evenwicht.

Proefpersonen. Drieënveertig Vlaamse gehoorgestoorde kinderen tussen 4 en 12 jaar, schoollopend in het reguliere onderwijs, met GON-begeleiding en zonder CP, visuele handicap of orthopedische afwijkingen. De controlegroep bestaat uit 43 Vlaamse kinderen tussen 4 en 12 jaar schoollopend in het reguliere onderwijs, zonder pathologie.

Methode. De motorische vaardigheden werden geëvalueerd door middel van de 'Movement Assessment Battery for Children' en de 'Körperkoordinations Test für Kinder'. Deze laatste werd specifiek gebruikt om de grootmotorische coördinatie en het evenwicht meer nauwkeurig te evalueren. Het statisch evenwicht werd nog eens extra onderzocht met een bijkomend item. Er werd zowel met de ogen open als met de ogen gesloten getest.

Resultaten. Gehoorgestoorde kinderen scoren lager op alle motorische tests. Bovendien heeft een cochleair implant (CI) effect op het evenwicht: kinderen met een CI scoren slechter. Er kan geen significant verschil aangetoond worden tussen de kinderen in het GON en deze in het Bijzonder Onderwijs.

Discussie en conclusie. Gehoorgestoorde kinderen hebben, zoals vorige onderzoeken reeds uitwezen, een motorische achterstand tegenover normaal ontwikkelende kinderen. Het effect van een CI daarentegen strookt niet volledig met de huidige literatuur.

Trefwoorden: auditieve handicap, cochleair implant, evenwicht

Prevalence of the metabolic syndrome and physical activity level in obese children

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Introduction

The metabolic syndrome is a condition characterized by insuline resistance, abdominal obesity, hypertriglyceridemia, low HDL cholesterol and hypertension. Subjects with MS have higher risk for cardiovascular diseases and type 2 diabetes. The MS in adults has already been extensively discussed in the literature, while data concerning the MS in children are rather scarce. The aim of this study was to investigate the prevalence of the MS and the relationship between the MS and physical activity (PA) in obese children.

Methods

Anthropometric measures were BMI and waist circumference. Blood pressure and blood biochemistry components of the MS were measured. Hours of PA were estimated using a self-made questionnaire. Five definitions of MS as proposed by leading medical scientific organisations were used to evaluate the prevalence of the MS among obese children.

Results

When BMI percentiles were used, 92.4% of the boys and 86.2% of the girls were obese (BMI \geq P 95). The others were overweight (BMI \geq P 85). Concerning the level of physical activity, 2.1% (n=2/96) of the boys and 1.7% (n=2/120) of the girls did not participate in sports at all. Thirteen percent of the subjects reported 2h of PA/week, this corresponds with the number of hours of Physical Education at school.

The prevalence of the MS was 18.9% in boys and 18.8% girls according to the definitions of the NCEP ATP III for children. In general, lower prevalences are observed when definitions for adults are used.

No meaningful correlations were found between PA and indicators for overweight on the one hand and the different components of the MS on the other hand. An exception was a moderate correlation ($r=0.44$, $p<0.05$) between BMI and MS.

Conclusion

Even in young overweight or obese children blood parameters predicting cardiovascular health problems were already present. In our sample higher MS prevalences were observed among adolescents (10y-16.99y) compared to children (3y-9.99y) when definitions for adults were used. The use of an appropriate definition, i.e. NCEP ATP III children, is indicated to determine the MS prevalence among children. The relationship between PA and MS remains unclear.

Analysis of various crawl styles within a leg-amputated swimmer

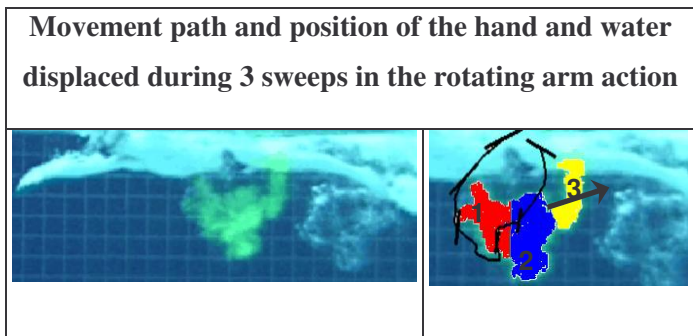
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Introduction. Only in few studies, stroke mechanics of disabled swimmers were analysed (e.g., 1, 2). Because optimal styles for disabled cannot really be inspired by those of valid swimmers, they have to experiment more than the others to detect the fastest style per event. In this paper, 4 styles of a right leg-amputated Paralympic swimmer were analysed to explain the effectivity. Based on the velocity variation of the hip, as a criterion for economy, and by visualising the water displaced by the arm, interpretations about propulsion will be made.

Methods. Four crawl styles were video-taped from underwater side view with a rotating camera (to focus on the swimmer's movement) and a fixed camera (to focus on movement paths and positions of the hand and on the water displaced): a rotating arm action, a style with a longer and with a shorter lever than usual and a glide stroke with high elbow. From a movement analysis, a phase diagram, the hip velocity variation, paths and positions of the hand were obtained. The water displaced was visualised using a tape with dye attached on the hand palm. Three separate clouds in the flow, resulting from 3 arm sweeps, were indicated in 3 colours on still pictures (using Photoshop): 1) in red, the cloud caused by the downward arm sweep; 2) in blue, by the inward sweep; 3) in yellow, by the out-upward sweep.

Results. In all styles, the hip velocity increased during 2 (left) leg actions, namely one normal out-downward and one in- (crossing over) downward: both are thus propulsive. The velocity was lower during the right arm action (than during the left) because he glides more when the normal left leg kick is given: this is more economical but less propulsive. Amazingly, he is faster during breathing although the crossing over kick, hindering the body roll, is given.



In the **glide stroke with high elbow**, the velocity increased during a down-forward hand movement (without other propulsive actions). Thus, the hand and forearm acting as a wing could generate propulsive lift force. This style was the most economical for a longer distance (200m). In pure sprint (50m), the swimming velocity was the highest in **the rotating arm action style**. This could be explained because the water was displaced best backwards (*arrow in figure*). In the **long lever** style, the water is consecutively displaced down-, up-, down- and upward. These displacements could counter-balance each other. Nevertheless, with a long lever, a large water mass is accelerated backward, which is interesting for propulsion, while with a **short lever** the water appears to be pulled close to the trunk in the body's turbulence, which disturbs propulsion.

Conclusion. This study gave some indications for further technique improvements: e.g., because when using a glide stroke with high elbow, the swimmer was able to generate lift force, he should also try to use this forearm position in his rotating action style in pure sprint. During this study, the performances were excellent although the training quantity was very limited, showing the value of experimenting and concentrating on own technique. In the future, breathing during the right arm pull, should still be experimented to obtain a body roll, a more equal velocity, and probably a higher swimming speed.

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In vitro onderzoek naar het effect van elektrische stimulatie op de creatine opname in spieren bij NMRI-muizen.

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Inleiding:

Creatine, meer bepaald creatinefosfaat, speelt een belangrijke rol in de energievoorziening in spieren. Vermits er geen creatinesynthese kan plaats vinden in de spier is deze volledig afhankelijk van opname. Een hoger creatinegehalte in de cel heeft zowel sportspecifieke als medische voordelen. Er kan slechts een beperkte toename van het creatinegehalte in de spier verkregen worden via een uitgekiemd oraal creatinesupplementatieprogramma. Zodoende is men op zoek naar betere manieren om creatine op te nemen in de spier. Robinson et al. (1) vonden een verhoogde creatineaccumulatie in de spier die voorafgaand aan het creatinesupplementatieprogramma een uitputtende inspanning onderging. Ter bevestiging van de resultaten in vivo willen we met deze invitro studie aantonen dat herhaaldelijke tetanische contracties, geïnduceerd via elektrische stimulatie, eveneens een verhoogd creatinegehalte geven in de spier.

Methoden:

Via dissectie namen we M. Soleus en M. Extensor Digitorum Longus uit beide achterpoten van mannelijke NMRI-muizen en plaatsten deze in een met zuurstof doorborrelde fysiologische buffer. Aan deze buffer stelden we een elektrisch stimulatie programma bloot waarmee we 12 minuten lang spiercontracties uitlokten. Aangezien we een gelijkstromig elektrisch stimulatieprogramma gebruikten, verkregen we een elektrolyse van de met zuurstof doorborrelde buffer. Om dit elektrolyse-artefact uit te sluiten hebben we drie protocols gevormd: een elektrolyse protocol, een contractie protocol en een elektrolyse in combinatie met contractie protocol. Om het effect te kunnen vaststellen werd elke spier die een protocol onderging, vergeleken met de gelijknamige spier uit de andere achterpoot die geen protocol onderging. Elke spier werd gedurende 30 minuten blootgesteld aan radioactief creatine, waardoor we achteraf de opname konden bepalen.

Resultaten:

Contracties in combinatie met elektrolyse zorgden voor een verhoogde creatineopname. Opmerkelijk is dat contracties alleen geen verhoogde opname teweeg brachten terwijl elektrolyse alleen dit wel kon. Er is reeds bewezen dat tijdens elektrolyse van de buffer vrije zuurstofradicalen gevormd worden. Toevoeging van vrije zuurstofradicalen inhiberende enzymen (Superoxide Dismutase en Catalase) kon het elektrolyse effect volledig teniet doen. Bij toevoeging van β -Guanidinopropionisch zuur konden we geen significant verschil opmerken tussen rust en elektrolyse.

Conclusie:

Met deze resultaten tonen we voor de eerste keer aan dat elektrische stimulatie van geïncubeerde spieren leidt tot een verhoogde creatine opname, waarmee we de in vivo resultaten bevestigen. De verhoogde creatineopname is echter voornamelijk te wijten aan elektrolyse van de buffer en niet aan de contracties zelf. De vorming van vrije zuurstofradicalen bij elektrolyse verklaren de verhoogde creatineopname. Deze verhoogde creatineopname bij elektrolyse is volledig creatinetransporter afhankelijk.

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Comparison of motor and behavioural characteristics in adolescents and adults with Rett syndrome or Angelman syndrome

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Introduction. Rett syndrome (RTT) and Angelman syndrome (AS) are both genetic developmental disorders that have only recently been genetically confirmed. Not much is known of these syndromes at an older age. The aim of this study was to document and compare the motor functioning in these 2 syndromes at a more advanced age to make differential diagnosis easier for clinicians.

Methods: Different aspects of motor function and behaviour were analysed by using the Rett syndrome motor-behavioural assessment scale (RSMBAS), which evaluates social and behavioural characteristics (subtotal 1), orofacial and respiratory characteristics (subtotal 2), physical signs and motor function (subtotal 3). The Hand apraxia scale (Burd et al. 1990), was used to evaluate hand function. In addition, spontaneous and evoked motor behaviour and the gait pattern were observed.

Results: Wilcoxon rank sum tests revealed significant ($p < 0.05$) differences between the 2 syndromes for subtotal 1 and 3 of the RSMBAS and for the total score on the Hand Apraxia scale with the Rett group having worse scores if compared to the Angelman group. Further analysis on item level revealed several significant differences between the groups on both scales. Also for the observation of the spontaneous and evoked motor behaviour, some items differed significantly. A significant difference was found between the RTT and AS groups for walking ability. Significantly more subjects with AS were able to walk. However, no significant differences were found in the gait pattern.

A significant correlation was found between age and social/behavioural aspects (subtotal 2) for the Rett group ($r = -0.59$; $p = 0.019$).

Conclusion: Rett and Angelman syndrome differed significantly in behavioural and social characteristics (subtotal 1 on the RSMBAS) with Rett subjects showing more regression in these functions. Also in motor and physical signs (subtotal 3 on the RSMBAS), Rett subjects again scored lower on e.g. hand stereotypes.

In comparison with AS subjects, subjects with RTT have less presence of gait, less reaction to offering toys and a more limited hand function.

These findings may be a first step in the clinical differentiation of RTT and AS at a more advanced age.

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Physical activity and quality of life in adolescents with cancer: a qualitative study

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Introduction: Cancer is a globally increasing health problem. Every year more than 10 million people are diagnosed with cancer.[1] Cancer and its treatment are associated with numerous adverse effects on Quality of Life (QOL). [2-4] Despite the evidence that physical activity improves QOL, cancer patients still get the advice to rest and to reduce their physical activity in order to prevent cancer-related fatigue. [4,5] When focussing on children and adolescents, the literature shows a substantial increase of the number of cancer patients in the last decades. [6] Adolescents receiving treatment for cancer face many difficulties, distinct from the difficulties of adults with cancer [7,8], but until now this interesting subgroup got limited attention in research. [9] The aim of this study is to report the findings of a qualitative study that explores the experiences of adolescent cancer patients with physical activity and to link those experiences with QOL.

Methods: Purposive sampling was used to select cancer patients aged 12 to 17, who had been diagnosed 6 months to 2 years earlier, who were treated in the department of paediatric oncology at the university hospital in Ghent and who were already in maintenance therapy. Data were collected through face to face semi-structured interviews. Interviews were audio taped, transcribed verbatim and analysed with the software program NVivo® using a thematic approach.

Results: Three basic themes emerged from the experiences of the participants with physical activity: a physical/functional, a psychological and a social theme. Those issues are similar to the dimensions of QOL. The themes appeared both before the diagnosis of cancer and during treatment and recovery, but differences appear within the themes when comparing the period before diagnosis with the phase of treatment/recovery.

Conclusions: In order to improve the QOL in adolescents with cancer it might be good to add more physical activity to their treatment. Attention should be given to all aspects of QOL.

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The effects of 8 weeks Whole Body Vibration on strength and flexibility with soccer players.

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Introduction: In literature we found only one previous study on the effects of Whole Body Vibration (WBV) with soccer players. Bosco et al (2001) did research on the changes in explosive strength, maximal strength and flexibility with professional soccer players and found significant changes in some of the tests (1). Our study is the first controlled study on the effects of WBV with soccer players. In this paper we want to investigate if WBV has an effect on quadriceps and hamstring strength, explosive strength and flexibility. Our second goal is to see if WBV can be integrated in the training schedules of an amateur team and give the same positive results as found by Bosco et al (2001) (1).

Methods: 15 players of an amateur soccer team were split in an experimental (E) and a placebo (P) group. Before and after the 8 weeks of WBV they were tested on maximal strength (leg extension and leg curl), extensibility (S&R and quadriceps) and jumping performance (squat jump (SJ), countermovement jump (CMJ) and 30s continuous jump (30sCJ). The players trained two times a week on the vibration platform for 5 minutes: one minute exercise and one minute rest and this was repeated five times. The frequency was 35Hz for E and 25Hz for P. The amplitude was in the first 4 weeks 2mm and 0.1mm (for respectively E and P group) and after 4 weeks 4mm and 0.2mm. We used the independent t-test to compare the means of the two groups. The variance was tested by Levene's test for Equality of Variances. We tested on a level of 5% significance

Results: We didn't find any significant changes for the tested variables. For the 1RM of E and P there is a slight improvement after 8 weeks of whole body vibration. CMJ showed a decrease for P while E didn't change. The same occurred with the power of the 30sCJ (a decrease in P and a slight increase in E, without significant changes). Hamstring and quadriceps flexibility showed an increase in both groups.

Conclusions: This is the first randomised controlled study on WBV with soccer players. Bosco et al (2001) did a study without control group and with professional players and found significant changes for explosive strength and extensibility explaining this only by WBV. We also noted an increase for flexibility but in both groups (E&P) so WBV is not responsible for the change. The reason we didn't find any significant results is due to the low frequency and volume, as reported by Luo et al. (2005) (2). But still we reported a tendency that predicts that vibration can have a positive effect on maximal strength, explosive strength and flexibility. Our second goal: can we integrate the WBV in the practice of an amateur soccer team? We did it, but it was practical very difficult: The players had to be on practice one hour earlier than normal and could only use the vibration platform (Fitvibe 600, Gymna nv, Belgium) for 5 minutes each. They only trained on the platform two times a week which is too little to report significant changes. The combination of small volume and low frequency while we still noticed some non significant positive changes makes us believe that WBV, with the same players but seen as an extra, separate training could lead to significant changes in maximal strength, explosive strength and flexibility.

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Acknowledgement: We want to thank Gymna for the use of the two vibration platforms (Fitvibe 600) and the voluntary cooperation during the study.

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Physical activity interventions among the elderly: The effects of a fitness vs. lifestyle program on physical and psychological self-esteem

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Introduction. The aim of this study was to examine the effects of two types of physical activity interventions on the physical and psychological self-esteem of elderly participants: an intensive centre-based fitness program and a less intensive home-based lifestyle program.

Methods. Participants were 120 sedentary Flemish volunteers who were older than 60 years and motivated to increase their physical activity. They were randomly divided into one of two intervention conditions. Participants in the fitness condition (n = 60) followed a supervised exercise program (90min) three times weekly. Participants in the lifestyle condition (n = 60) were encouraged to include more physical activity in their daily lives. They were offered practical information on home-based exercises and signed a physical activity contract with a personal coach who followed their progress by telephone on a less than weekly basis. The effects of these two interventions were compared with a control condition (n = 66). After 5 and 11 months, respondents completed the Physical Self-Perception Profile¹ as well as measures of physical and psychological well-being² and of general self-esteem³.

Results. The fitness and lifestyle condition produced a significant and similar increase in physical well-being, in self-perceived physical fitness, and in self-perceived body attractiveness, while the control condition showed no differences on these measures. Moreover, only the lifestyle condition, but not the fitness nor control condition, produced a significant increase in general self-esteem.

Conclusions: The lifestyle intervention had similar positive effects on physical self-esteem as the fitness intervention, and an even more positive effect on psychological self-esteem. This implies that the efficacy of the lifestyle intervention was higher than that of the fitness intervention given that the fitness intervention was more intensive and expensive with respect to supervision. Considering that most elderly are not attracted by the culture of fitness centres, these results indicate that governments should consider to invest in personal coaches that motivate older people to integrate physical activity in their daily life.

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* This research was supported by the Policy Research Centre Sport, Physical Activity and Health funded by the Flemish Government.

Influence of combined exercise training on indices of obesity, diabetes and cardiovascular risk in type 2 diabetes patients.

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Introduction. The influence of combined exercise training on indices of obesity, diabetes and cardiovascular risk in type 2 diabetes patients was investigated compared to endurance training.

Methods. Twenty five type 2 diabetes patients (female: 10, male: 15) (general practice, Sas-van-Gent, Holland) were randomly assigned to three experimental groups (COM: combined exercise training (n=12); END: endurance training (n=7) and C: control (n=6)). Patients exercised for three months three times a week for 1 hour. Before and after the training period following parameters were assessed: 6 minute walk test, 1 RM of upper limb (sum of 1RM of m. Biceps brachii and m. Triceps brachii) and lower limb (sum of 1RM of m. Quadriceps femoris and mm. Hamstrings), sit to stand, length, weight, BMI, body composition (fat mass, fat free mass), HbA1c, glycemia, HDL, triglycerides and cholesterol.

Results. COM had significant higher results on the sit to stand ($P<0,01$), strength upper limb ($P<0,01$), strength lower limb ($p<0,01$) compared to C. Glycemia ($P<0,05$), HbA1C ($P<0,05$) and cholesterol ($P<0,05$) showed a significant decrease (Com) respectively increase (C), while HDL showed an opposite evolution. Also a decreasing respectively increasing trend was shown in weight resp. fat free mass ($P<0,1$). END had significant higher results on the 6 minute walk test ($P<0,01$) and strength upper limb ($P<0,01$) compared to C. A significant lower HbA1C concentration was shown ($P<0,05$) in END. Compared to END, COM had significant higher results on sit to stand ($P<0,01$), strength upper ($P<0,01$) and lower limb ($P<0,05$). A decreasing respectively increasing trend was shown in weight respectively fat free mass ($P<0,1$). Concerning HbA1c and HDL levels no significant differences were noticed.

Conclusion. Combined exercise and endurance training had a positive influence on indices of obesity, diabetes and cardiovascular risk in type 2 diabetes patients. Compared to endurance training, combined exercise training had a tendency to produce better results.

Physical activity levels in 10 to 11 year-olds: clustering of psycho-social correlates.

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The promotion of PA is needed as early as in childhood and has to be based upon its most important determinants in that population. In children relatively few psychosocial variables have been assessed and the most important psychological determinants at young age are found to be attitude, self-efficacy, social support and perceived benefits and barriers.

Purpose: To evaluate gender differences for PA levels and for psycho-social correlates in a sample of 10 to 11 year old boys and girls, to evaluate whether psychosocial correlates cluster in meaningful ways and to examine whether PA and sedentary behaviour differ between children of clusters, differentiated by the level of perceived barriers and benefits, attitudes, social support and self-efficacy.

Methods: In a school sample of 1124 10 to 11 year olds (579 boys and 545 girls) PA levels and psycho-social correlates were evaluated by questionnaire (Flemish Physical Activity Questionnaire).

Results: Girls were found to be less active than boys, with boys scoring better for social support, perceived benefits and self-efficacy compared to girls. The way of clustering differed between boys and girls. Boys were allocated to 3 clusters, one cluster with positive correlates towards physical activity, labelled “positives”, one with negative correlates, labelled “negatives” and one, mainly characterized by high perceived barriers, labelled “hindered”. In both genders the highest levels of PA were found in the “positives”, the lowest in the “negatives”. In girls a fourth cluster was identified, mainly characterized by low perceived barriers and low social support. PA levels in the girls of this cluster, labelled “indifferents”, were the second highest.

Conclusions: While in both genders significant cluster differences were found for PA levels, sedentary behaviour did not differ significantly between the clusters. More research is needed to further characterize these clusters. To prevent the PA decline during the transition from childhood to adulthood novel interventions need to be explored that focus on children of the clusters with the most negative correlates.

Walking in sand : what can we learn from footprints ?

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Introduction

In contrast to skeletal remains, fossilised footprints contain information about the dynamics of early hominin gait. For instance, the Laetoli footprints (3.6 million years old) may provide evidence from a crucial stage in hominin evolution, that of early bipedalism in Australopithecus. However, interpretation of fossilised footprints is not self-evident, as they are likely the combined result of foot anatomy, gait dynamics and substrate properties. We set out to explore how footprints are generated in modern humans, in an attempt to determine which factors determine the morphology of a footprint. This paper presents the first, preliminary results.

Methods

Sixteen healthy subjects (7 male, 9 female, age: 24.7 ± 3.3 years) walked on a solid surface and in a 4 cm layer of fine-grained sand (established during preliminary experiments) at preferred speed. In each condition, kinematics were recorded for 15 trials using a 12 camera Vicon system, tracking the left lower limb and the foot as a multi-segmented structure. Additionally, plantar pressures (RSScan 1 m Footscan plate) and ground-reaction forces (Kistler) were recorded. After each trail in sand, the depth of the imprint was measured at specific sites under the heel, midfoot, metatarsal heads and hallux, using calipers.

Results

Subjects walked slower in sand than on solid ground and kinematics differed mainly during swing phase (e.g. more flexion of the knee during swing and less extension prior to heel strike).

Maximal pressure under the heel was the most influential factor for footprint depth at this site, but dimensionless speed and foot morphology also played a role. The footprint depth at the midfoot is best predicted by foot morphology. At the 2nd metatarsal head, footprint depth is mainly determined by peak pressure and maximal impulse. The depth of the hallux imprint correlated best with body mass and with hallucal peak pressure.

Conclusions

The main conclusion of this pilot study is that footprint morphology cannot be related to a single variable (e.g. plantar pressure). Different zones of the footprint reflect different aspects of the kinesiology of walking. Therefore, an integrated approach, combining detailed kinematics, plantar pressure measurements, kinetics, and morphological data, is needed to gain an insight in the generation of footprints.

Supported by grant G.0125.05 of the FWO-Flanders.

Efficacy of sequential or simultaneous computer-tailored interventions for increasing physical activity and decreasing fat intake

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Introduction

Little evidence exists about the effectiveness of 'interactive' computer-tailored interventions, and about the combined effectiveness of tailored interventions on physical activity and diet. Furthermore, it is unknown whether they should be executed sequential or simultaneous. The purpose was to examine (1) effectiveness of interactive computer-tailored interventions for increasing physical activity and decreasing fat intake; and (2) which intervening mode, sequential or simultaneous, leads to most behavior change.

Methods

Participants (N = 771) were randomly assigned to receive (1) the physical activity and fat intake interventions simultaneously at baseline; (2) the physical activity intervention at baseline and the fat intake intervention three months later; (3) the fat intake intervention at baseline and the physical activity intervention three months later; (4) or to a control group.

Results

Six months post-baseline the results showed that the tailored interventions produced significantly higher physical activity scores [$F(2,573) = 11,4; p < 0.001$] and lower fat intake scores [$F(2,565) = 31,4; p < 0.001$] in the experimental groups when compared to the control group. Differences between the sequential and simultaneous intervening modes were relatively small.

Conclusions

The interactive computer-tailored physical activity and fat intake interventions are effective in inducing behavior change and can be used either sequential or simultaneous.

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Gait related risk factors for exercise-related lower leg pain

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Introduction. Exercise-related lower leg pain (ERLLP) is a common and enigmatic overuse problem in athletes and military populations. However, very little is known about the gait related variables that predispose athletes to this injury. A recent prospective investigation showed that subjects susceptible for ERLLP showed an altered barefoot running pattern which included a central heel strike, a significantly increased pronation, accompanied with more pressure underneath the medial side of the foot and a significantly more lateral roll-off (1). However, most of athletes perform their sports in shod condition; therefore, the purpose of the current study was to prospectively determine gait related risk factors for ERLLP during shod running and to additionally compare the shod with the barefoot risk factors.

Methods. The gait pattern during shod running of 400 physical education students was evaluated at the beginning of their academic study. This was accomplished by means of plantar pressure measurements and 3D-gait kinematics during shod running at a speed of 3.33m/s with a standard neutral shoe. The experimental set-up consisted of a 2m x 0.4m AMTI-force platform set into a 16.5m indoor running surface. Plantar pressure data were collected with a Footscan pressure plate (RsScan Int, 2m x 0.4m, 480Hz), mounted on top of the force platform. Kinematics were collected at 240Hz using 7 infrared Proreflex cameras and Qualisys software. After this evaluation, the same sports physician registered all sports injuries during this study. During the follow-up period, 46 subjects developed ERLLP, of whom 29 subjects had bilateral complaints. So 75 symptomatic lower legs (35 left and 40 right) were classified into the ERLLP-group. Bilateral feet of 167 subjects who sustained no injuries at the lower extremities served as control group.

Results. Cox regression analysis revealed that subjects who will develop ERLLP have an altered running pattern compared to the control subjects. More specifically, these subjects showed a significantly increased tri-planar pronation excursion (summed pronation excursion components), accompanied with more pressure underneath the medial side of the foot, a delayed maximal eversion and an accelerated re-inversion.

Conclusions. The findings of this study suggest that altered gait biomechanics during shod running play a role in the genesis of ERLLP. The results are in accordance with recent previous research during barefoot running (1). To prevent these overuse injuries, athletes should be screened on identified risk factors and these parameters should be adapted.

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Validation of cheap pedometers against the Yamax Digiwalker SW-200 in adults

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Objective: Nowadays cheap pedometers are available to the public or used as merchandising products. The purpose of the present study is to evaluate if cheap pedometers of the brand 'Stepping Meter' are valid in counting steps in adults.

Design: The validity of 973 cheap 'Stepping Meters' was tested against the Yamax Digiwalker SW-200 in free-living conditions.

Subjects and Setting: A convenience sample of 35 healthy volunteers (20-60 year of age) wore 1 validated Yamax Digiwalker SW-200 pedometer and 5 pedometers from a cheap brand called 'Stepping Meter' (€ 1 or \$ 1.2 per pedometer) during one day. Every day 5 other cheap pedometers were worn until all pedometers were tested. Steps of all pedometers were registered and the differences between counts from the Digiwalker and the 'Stepping Meter' were expressed as percentage of the valid value of the Digiwalker step counts. The criterion used to determine a 'Stepping Meter' as a valid pedometer was a deviation of maximum 10 % from the Yamax Digiwalker step counts.

Results: Results indicated that only 252 (25.9 %) 'Stepping Meters' met the criterion, whereas 74.1 % made an over- or underestimation of more than 10 %. In more than one third (36.6 %) of all invalid 'Stepping Meters' the deviation was 50 % or more. Most (64.8 %) of the invalid pedometers overestimated the actual steps taken.

Conclusions: The cheap 'Stepping Meters' can not be used for physical activity promotion targets because of the low validity, resulting in incorrect information on step counts.

Sensory contributions to postural control in children with DCD

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Introduction: Clumsy children without overt neurological diseases or mental retardation nowadays are diagnosed as having Developmental Coordination Disorder (DCD; APA 1994). They suffer from coordination problems in a broad range of activities of daily living involving fine or gross motor skills. So far, the true underlying mechanisms of the disorder remain unclear, however DCD has often been associated with deficits in the perception and/or processing of sensory information (3). It has been shown previously that children with DCD who display poor functional balance skills have a less adequate postural control strategy with increased amounts of postural sway and muscular co-activation in the lower leg (1). However, more insight should be gained in the dynamic interplay of the sensory modalities contributing to the control of posture in children with DCD.

Methods: In ten 6- to 8-years-old boys with DCD, postural control during bilateral quiet stance was assessed under four different task constraints (standing on a stable or unstable surface, with the eyes open or closed). While standing on a Basic Balance Master force plate (NeuroCom Inc., Clackamas, OR-USA) angular sway was measured and compared with the performance of ten matched typically developing children (TD-children). None of the children of both groups had functional balance problems as measured with the Movement Assessment Battery for Children (M-ABC).

Results: Children with DCD show higher mean COG sway velocities, indicating increased amounts of postural sway in all conditions ($F_{1,18} = 17.74$, $p < .01$) (Figure 1). Further analysis of the Stabilisation Ratios (SR), expressing the contribution of a sensory modality, revealed that children with DCD were more reliant on visual information than the TD-children in the baseline condition ($t_9 = 3.14$, $p < .01$). Moreover, children with DCD appeared to demonstrate less sensory adaptation to changing task demands. In contrast with the TD-children, in children with DCD the contribution of vision did not increase when standing on an unstable, compliant surface ($F_{1,18} = 7.40$, $p < .05$). When vision was removed, the role of proprioception and the vestibular system became more important in both groups, but again to a greater extent in the TD-children ($F_{1,18} = 5.12$, $p < .05$).

Conclusions: Children with DCD display subtle differences in the control of posture in bilateral stance with an overall increase in postural sway, a greater reliance on vision, and difficulties with 're-weighting' of sensory information in response to the specific task demands. This inability to 're-weight' from other sources of information might be caused by a poorly developed internal multi-sensory model. Supported by the fact that this sub-group of children with DCD did not have particular balance problems, this 'compensation' deficit is likely to underlie problems in other skills than postural control. In addition, given the indispensable role of an intact postural control system for the acquisition and execution of virtually all voluntary movements (2), these problems may negatively affect a broad range of activities of daily living.

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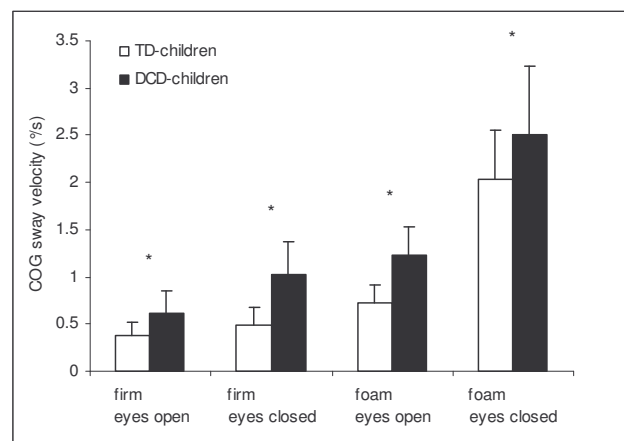


Figure 1 Mean COG sway velocity; * indicates significant group effect ($p < .05$)

Polymorphisms in the myosin light chain kinase (MLCK) gene: association with knee strength in young adult males.

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Introduction: Individual differences in strength performance within the population are well documented in literature. Results of twin and family studies stress the importance of underlying genes – besides environmental influences - as causal factors in explaining the variance in this quantitative trait. The first associations between strength related phenotypes (dynamic, isometric strength, muscle cross sectional area,...) and single nucleotide polymorphisms (SNP's) were reported in the late '90s (2). Very recently, researchers demonstrated that variations in genes coding for specific myofibrillar proteins, e.g. the myosin light chain kinase gene (MLCK), influence phenotypic responses to eccentric exercise involving muscle damage. MLCK functions to phosphorylate myosin's regulatory light chain (RLC). Although the binding of Ca²⁺ to tropomyosin-troponin is the primary regulator of skeletal muscle contraction, RLC plays an important modulatory role in force development.

Purpose: To determine whether 2 non-coding polymorphisms (C37885A and C49T) in MLCK on chromosome 3q21.1 are associated with knee strength in humans.

Methods: We randomly selected 370 male Caucasian sibs from the Leuven Genes for Muscular Strength Study (LGfMS). These young male adult (17-36 yr) and healthy participants, ascertained from the general population, were volunteers, and no special selection based on sport, exercise, or physical activity was made, to avoid a selected physically active sample. The Cybex NORM isokinetic dynamometer was used for isometric and concentric knee strength tests. In this report, only peak torque of isometric knee flexion and extension at 30° (KPTFL3M, KPTEX3M) and 60° (KPTFL6M, KPTEX6M) were used in further analyses. Both SNPs were genotyped using the Sequenom platform. Association was analyzed by AN(C)OVA with significance level set at $p < .01$.

Results: Genotype frequencies did not differ from those expected by Hardy-Weinberg equilibrium ($p = 0.54$ and 0.88 for C37885A and C49T respectively). We found significant associations of the C37885A polymorphism with the four phenotypes in the present study ($p < .0001$). Higher isometric hamstrings muscle strength at both 30° and 60° flexion was found in men with the homozygous C/C wildtype genotype (8%-12%) and the heterozygous A/C genotype (5%-11%) compared to the mutant A/A homozygotes ($p < .0001$). However, lower isometric knee strength at both 30° and 60° extension was found in men with the homozygous C/C wildtype genotype (13%-17%) and the heterozygous A/C genotype (13%-15%) compared to the mutant A/A homozygotes ($p < .0001$). No difference in strength performance at both angles was found between A/C and C/C genotypes. The same significant results were demonstrated after correction for anthropometrically estimated muscle bone area of the thigh and muscle area of the quadriceps muscle except for KPTFL3M where A/A homozygotes and A/C heterozygotes did not differ in strength performance. Furthermore, we failed to demonstrate significant association of the C49T polymorphism with the four strength phenotypes.

Discussion: A study investigating exertional rhabdomyolysis demonstrated different creatine kinase and myoglobin responses after strenuous exercise for different MLCK genotype groups (1) in a mixed male/female population. Furthermore, the C49T polymorphism was associated with baseline strength in the subpopulation of men while the C37885A polymorphism was associated with post-exercise strength loss for the entire sample. The present study focuses on the association of baseline isometric strength in the knee joint with both polymorphisms. Our findings suggest that the MLCK C37885A polymorphism is one of the polymorphisms explaining variation in baseline isometric knee strength in a population of young male adults. Furthermore, possible evidence for a dominant C allele was provided by the non-significant strength differences between subjects with genotypes A/C and C/C. In contrast to Clarkson et al. (2005) we failed to find association between the MLCK C49T polymorphism and the four strength phenotypes in the present study.

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Trunk muscle endurance: test-retest reliability and reference values in 8 to 11 year old children

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Introduction: The high prevalence of Low Back Pain (LBP), the mounting levels of non-specific LBP among youngsters in our society and the indications that juvenile and adult LBP are related,¹ suggest the need for research into the early stages of the problem.

The multi-factorial nature of the risk for back pain in childhood and adolescence is widely accepted.² One of the underlying mechanisms among the many risk factors for low back pain is low back stability. ³ In terms of spinal protection, trunk muscle endurance as well as a balanced trunk muscle development contributes to low back stability. In conclusion, the trunk muscle endurance pattern of young individuals may be an important factor in the multidimensional approach to prevent back pain. Therefore, the need for reliable trunk muscle tests that are safe, inexpensive, quick and easy to administer is pressing. The lack of standards and reference values in children is a problem.

The purpose of the current study was to determine test-retest reliability and reference values of trunk extension and trunk flexion endurance testing in healthy elementary schoolchildren. An additional objective was to compare young children reporting back pain with children not reporting pain for trunk muscle endurance measurements.

Methods: A total of 177 children performed static trunk muscle endurance tests. A sub sample was retested after one week. The subjects kept the trunk both in an extended and a flexed horizontal position until exhausted (Figure 1 and 2). The maintaining of the correct horizontal posture in the sagittal plane was supervised. The score was the endurance time, measured with a stopwatch, for a maximum of 240 seconds. To evaluate the prevalence of back and neck pain within the last week, the children completed a questionnaire on self-reported back and neck pain. The Ethical Committee of the University Hospital of Ghent University approved the study.

A test-retest reliability evaluation was performed using Pearson correlation coefficients (r) and Single Measure Intra-class Correlation Coefficients (ICC). To determine reference values, the children were divided in four age categories: the 8, 9, 10 and 11 year olds. Independent Sample T-tests were executed to study differences in trunk endurance performances and characteristics between children with and without reported back or neck pain.

Results: The reproducibility was good for trunk flexion ($r=0.82$, $P<.001$) and acceptable for trunk extension endurance testing ($r=0.63$, $P<.001$). Gender differences were not significant. Trunk flexion endurance times increased with age ($F=4.15$, $P<.05$). Children reporting back or neck pain performed lower on trunk flexion endurance testing ($t=2.29$, $P<.05$).

Conclusions: Trunk muscle endurance testing is reliable in 8 to 11 year-old children. There are indications that, at a young age, trunk flexion endurance plays a role in self-reported back or neck pain.

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Physical activity and endurance in normal weight versus overweight boys and girls.

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Background: Some studies found lower levels of physical activity and fitness in overweight children, compared to normal weight children, while others have failed to observe any difference. Therefore the purpose of the present study was to reinvestigate differences in physical activity and fitness between overweight and normal weight children.

Methods: A random sample of 121 boys and 101 girls of 11 to 13 years old was selected. Children were divided into overweight/fat and normal weight/fat groups based on measures of body mass index and percentage of body fat. Physical activity level was assessed by accelerometers and a Physical Activity Questionnaire. Physical endurance was measured by the Cooper Test.

Results: Accelerometer data revealed that overweight/fat children were less moderate to vigorous physically active when compared to normal weight/fat children. They also performed worse on the physical endurance test ($p < 0.001$). Overweight children reported to be less active in leisure time ($p < 0.05$) compared to normal weight children. Overfat girls reported to participate less in sports activities compared to normal fat girls ($p < 0.05$).

Conclusion: The present study found clear differences in physical activity and physical fitness between overweight/fat and normal weight/fat 11 to 13 year olds. A major strength of the present study is that similar results were shown based on different estimates of overweight and activity in a relatively large sample of children.

Effect of a clipless pedal with a lowered contact surface on the sprint performance in cycling.

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Introduction. The existence of an optimal isokinetic sprint pedaling frequency indicated the influence of crank velocity on the power output in sprint cycling (1, 3). Moreover, a longer lever arm allowed to develop higher levels of propulsive torque, exerted on the chainwheel, in the downstroke of the pedaling cycle (2). Therefore, the aim of the present study was to compare the power-velocity relationship in maximal isokinetic sprinting using two types of pedals: a first experimental pedal system (EP) with a lowered contact surface, involving the lengthening of the functional crankarm (=distance between the center of the cranks and the contactpoint) and a second control pedal system (CP) being the cyclists habitual pedal system.

Methods: Maximal isokinetic sprint performance was evaluated on a self developed isokinetic ergometer allowing each subject to use his own bicycle. In a randomized order, sixteen cyclists [age (mean \pm SEM): 25 ± 1 yr; height: 1.81 ± 0.01 m; body mass: 72.8 ± 1.7 kg; training kilometres per year: 9460 ± 1390 km/yr; cycling experience: 5.7 ± 0.7 yr] performed two intermittent sprint tests on separate days (48-72 hours period in between), one with the control pedal system (CP) and the other one with the experimental pedal system (EP). The sprinttests consisted of five, short (5 s) maximal isokinetic sprints at fixed cadences of 40, 60, 80, 100 and 120 rpm respectively. Each sprint was followed by a 2 min recovery interval at 100 watt at 80 rpm. The effective torque (T) and were continuously measured during consecutive crank revolutions at a frequency of 1 KHz. Power output (P) was then averaged per pedaling cycle.

Results: At all cadences a significant gain in power output was observed in favor of EP (CP versus EP: 509.2 ± 18.2 W / 537.8 ± 17.1 W; 794.9 ± 29.1 W / 827.9 ± 28.2 W; 968.1 ± 31.3 W / 1003.6 ± 33.2 W; 1051.1 ± 39.0 W / 1075.9 ± 38.5 W; 1036.6 ± 37.8 W / 1054.9 ± 39.8 W; at respectively 40, 60, 80, 100 and 120 rpm; $p < 0.05$). The maximal sprint power output was significantly higher using EP (1061.7 ± 40.2 W in CP versus 1082.5 ± 40.1 W in EP; $p < 0.05$). The according optimal sprint cadence was significantly reduced (107.8 ± 1.7 rpm in CP versus 104.1 ± 1.0 rpm in EP; $p < 0.05$). Furthermore, the relative gain in poweroutput tended to be smaller as cadence increased ($6.0 \pm 1.5\%$, $4.4 \pm 0.8\%$, $3.7 \pm 0.6\%$, $2.5 \pm 0.6\%$, $1.8 \pm 0.7\%$, at respectively 40, 60, 80, 100 and 120 rpm). An increase in functional crankarm length was demonstrated to be the underlying mechanism of this improvement.

Conclusions: Sprint power output increased using EP. Compared to CP, the according optimal sprint frequency was lower in EP. More research is needed to evaluate the qualities of EP for racing in all types of cycling events including efforts of longer duration.

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Treadmill versus overground run-to-walk and walk-to-run transition speed in unsteady state locomotion conditions

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Introduction. Recently it has been argued that the transition between walking and running is a gradual process instead of a distinct event [2]. If this is true then transitions should preferably be studied in a protocol with gradually changing speed. Furthermore it has been found that the magnitude of acceleration has an effect on the transition speed. The easiest way to impose such a constant acceleration is by the use of a motor driven treadmill. However various kinematical [1], physiological and perceptual differences exist between treadmill and overground locomotion. It might be possible that one or more of these differences affect the run to walk transition (RWT) or the walk to run transition (WRT). The purpose of this preliminary study was to determine whether treadmill versus overground locomotion differ in transition speed.

Methods. 4 subjects performed several RWT's and WRT's at 3 constant accelerations (± 0.05 , ± 0.07 and $\pm 0.10 \text{ms}^{-2}$) on a motor driven treadmill and an overground walkway. In the treadmill protocol transition speed was defined as the average speed of the treadmill belt during the transition step. In the overground protocol the constant acceleration was imposed by means of a row of flashing lights which the subjects had to "follow". The transition speed was defined as the average forward speed of a marker at C7.

Results. The average transition speed of each subject is shown in two scatter plots: one for the RWT's (figure 1) and one for the WRT's (figure 2). In figure 1 we see no systematic relation between the average RWT speed in the overground condition and the treadmill condition. From figure 2 however it seems that all subjects started running sooner (i.e. at a lower speed) when they performed a WRT on the treadmill. Non parametric analysis with a Wilcoxon test showed a trend towards significant differences between the overground condition and the treadmill condition in all three WRT accelerations. ($p = .068$, $Z = -1.83$)

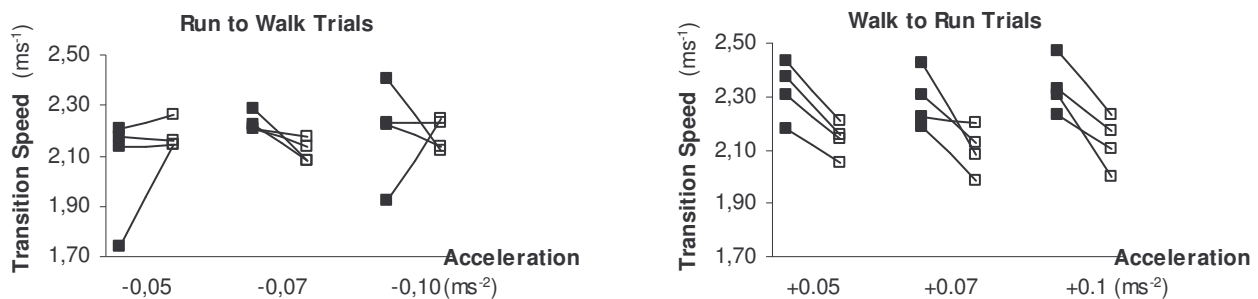


Figure 1: RWT transition speed of four subjects in the overground- (filled squares) and treadmill condition (open squares)

Figure 2: WRT transition speed of four subjects in the overground- (filled squares) and treadmill condition (open squares)

Conclusions. The results can probably be linked to the fact that many authors reported that subjects tend to change their kinematics in order to avoid falling off the back of a treadmill [1]. It makes sense that the subjects only alter their transition speed in the WRT condition because the WRT is probably more intimidating than the RWT. The results of this preliminary study should be interpreted with caution, because of the small population. Nevertheless a clear difference has been found, so we believe that it is worthwhile to continue this research in order to determine if the use of a treadmill can be justified in transition studies.

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Familial resemblance in physical activity

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Introduction: The importance of an active lifestyle for health and fitness is well documented. Physically active adults are at reduced risk for morbidity and mortality from a number of chronic diseases (1). Because it is likely that exercise and activity habits established in childhood and adolescence influence the level of physical activity in adulthood, it is important to focus on determinants of physical activity during that period (2). Physical activity in children and adolescents is a complex behaviour, influenced by many factors (3). Familial resemblance, reflecting both genetic and environmental factors shared by family members, could be one of the major determinants of physical activity in childhood and adolescence. The purpose of the present study is to study familial resemblance in physical activity.

Methods: 148 fathers (47y ± 0.7), 106 mothers (44.9y ± 2.6), 60 sons (17.3y ± 1.8) and 45 daughters (17.1y ± 2.2) of the Flemish Longitudinal Offspring Study (FLOS) participated in this study. Physical (in)activity was assessed using the Flemish Physical Activity Computerized Questionnaire (FPACQ) including frequency of moderate and vigorous physical activity, sports participation, active transport to school, to work or in leisure time and household and garden activities. Watching TV was included as measure of inactivity. Pearson product moment correlations were calculated between all family members to estimate familial resemblance in physical activity.

Results: The parent-son correlations showed consistently moderate associations for physical inactivity indicators ($0.26 \leq r \leq 0.51$), whereas the father-daughter relationship was more consistent for physical activity measurements (active transport during leisure time and hours moderate activities per week). In addition, the mother-daughter correlation for number of vigorous physical activities per week was quite high ($r = 0.41$). The highest correlation between offspring was found for inactivity (amount of hours watching TV, $r = 0.35$); none of the offspring correlations for physical activity were significant. Finally, spousal correlations ranged from 0.08- 0.34 for all physical (in)activity indicators.

Conclusions: Parents' physical activity levels were more associated with their daughters' physical activity levels whereas parents' inactivity levels were more associated with their sons' physical inactivity levels. Resemblance between siblings is also higher for physical inactivity than for physical activity.

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Acknowledgements

The Flemish Longitudinal Offspring Study (FLOS) is a follow-up study of the Leuven Longitudinal Study on Lifestyle, Fitness and Health and the Leuven Growth Study of Flemish Girls. The Flemish Longitudinal Offspring Study is part of the research program of the Policy Research Centre Sport, Physical Activity and Health financed by the Flemish Government.

Effects of temporal constraints when catching in the dark.

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Introduction. In the early 70's, Whiting and colleagues realised a series of experiments concerning the existence of a critical time interval for viewing the ball in flight (Whiting et al. 1973, Sharp & Whiting 1975). The suggestion was made that occluding vision of the ball during the final 250-300ms was not detrimental for catching performance. More recently, the work of Whiting was revisited from another point of view: the viewing time of the ball was manipulated by the catcher himself, by coupling movement initiation and illumination (Mazyn et al. 2004). A promptly switch from an on-line movement control strategy when catching under normal illumination towards a motor programming mode when catching in the dark was observed. In the present study, this self paced light-dark condition was challenged under varying temporal constraints, in order to further explore the adjustment capacity of the human perceptuo motor system. If indeed a rigid motor program is involved in the dark, then no speed effects were expect to appear in the experimental condition.

Methods. Twelve proficient ball catchers caught yellow tennis balls approaching at tree different speeds of respectively 8.7, 10.5 and 13.2m/s with their preferred hand. Balls were projected by a launching machine from a distance of 8.4 m, under two different illumination conditions. The first 10 catches in each speed condition were performed under normal illumination. Subsequently the participant was faced with the light-dark condition: as soon as the participant initiated his/her catching movement, all laboratory lights went out within 1 ms and the catch had to be completed in total darkness. The participants trained this light-dark condition in blocks of 10 trails, until a satisfying performance level (7 out of ten successful catches) was achieved. 3D-kinematics of the 10 catches in the full light and 10 successful trails after reaching the criterion in the light-dark condition, were recorded by means of an 8-camera infrared motion capture unit (Qualisys) at 240 Hz. Kinematic variables were analyzed using a 3 (ball speeds) x 2 (light conditions) repeated measures Anova analysis.

Results and discussion. The expected speed effects that appeared in the full light condition are in line with earlier work of Laurent et al. (1994): a decrease in movement time, increase in straightness of the wrist trajectory and a backward shift of the interception point were found. However, these speed effects disappeared when catching in the dark. The informational constraints of the task seem to compel the catching movement into a definite movement pattern, regardless of the additional temporal constraints imposed on the task. In order to deal with the imposed informational constraints a movement with similar kinematic features was produced under the three different ball speed conditions. Second, participants postponed the initiation of their catch until approximately 290ms prior to contact, regardless of ball speed. This finding corroborates the work of Whiting et al. and confirms the formerly proposed magnitude of the critical time interval of about 250-300ms. In general, these results emphasise once again the large adaptability of the human perceptuo-motor system to deal with restrictions imposed by the environment and/or task.

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Voetballers doen het beter met kleuren!

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Inleiding: In 1998 werd de eerste gekleurde voetbal geïntroduceerd op het WK voetbal in Frankrijk. Een voetbal is vanaf dan een belangrijk commercieel product geworden en heerst er een strijd tussen commerciële grootmachten om de beste voetbal te ontwerpen en uiteraard te verkopen. Clubs blijven (relatief) vrij om het baltype waarmee wedstrijden worden gespeeld, te kiezen. Wetenschappelijk onderzoek over het gebruik van gekleurde voetballen is nagenoeg onbestaande. In het volleybal werd het reglement vanaf 1998 aangepast en wordt er met gekleurde ballen gespeeld. Onderzoek wees uit dat het gebruik van specifieke kleurpatronen de spelers in staat stelt sneller te reageren op het gedrag van de bal in receptietaken wanneer dit werd vergeleken in situaties waar een effen witte bal werd gebruikt¹. Dit onderzoek had tot doel het effect na te gaan van gekleurde voetballen (met eigen patroon en kleurcombinatie) in vergelijking met een witte voetbal op de perceptie van de balbaan bij ervaren voetballers.

Methoden: Vijftien mannelijke voetballers (25.3 ± 5.0 jaar) met ervaring in nationale afdelingen namen deel. Vier baltypes (maat 5) werden gebruikt: effen witte bal (Kimpex), grijs-zwarte Roteiro (Adidas), wit-rode T90 Aerow (Nike) en geel-blauwe 90 High-Vision Aerow (Nike). De ballen werden afgeschoten met een ballenmachine (Jugs, USA) over een afstand van 28 m volgens vijf balbanen (rechts met rotatie naar midden, links met rotatie naar midden, rechtdoor naar midden zonder rotatie, rechts zonder rotatie, links zonder rotatie). De laatste drie balbanen werden gebruikt om anticipatie uit te sluiten, maar worden verder niet gebruikt in de analyse. Elk baltype werd per balbaan drie maal afgeschoten volgens gerandomiseerde volgorde. De test bestond uit het uitvoeren van 72 balcontroles. Elke controle werd opgenomen met een high speed camera (125 Hz) die 6 m achter de spelers stond opgesteld om de laterale verplaatsingen te kwantificeren. De reactietijd (RT, msec), de horizontale afstand tussen het hoofd bij de verste uitwijking van de speler en de bal bij balcontact (HB, m), en de horizontale afstand tussen het hoofd bij de verste uitwijking van de speler en het hoofd bij balcontact (HH, m) werden gehanteerd als afhankelijke variabelen. Een variantie-analyse voor herhaalde metingen werd gehanteerd met $p < 0.05$.

Resultaten: De balbaan beïnvloedde de RT significant ($F_{2,28}=5.504$, $p < 0.05$, $\eta^2=0.282$). Reactietijden waren groter bij de balbaan rechtdoor zonder rotatie. Het baltype bleek de RT niet significant te beïnvloeden ($F_{3,42}=1.044$, $p > 0.05$, $\eta^2=0.069$). Er was geen interactie tussen baltype en balbaan ($F_{6,84}=1.006$, $p > 0.05$, $\eta^2=0.067$). Wat betreft HB, werden enkel hoofdeffecten gevonden voor balbaan en baltype. De HB was significant groter voor de linker balbaan ($F_{1,14}=16.196$, $p < 0.05$, $\eta^2=0.536$) in vergelijking met de rechter balbaan. Belangrijker echter was het significante effect voor baltype ($F_{3,42}=4.571$, $p < 0.05$, $\eta^2=0.246$). Uit de analyses bleek dat de horizontale afstand groter was bij de witte bal. Dit bleek eveneens voor HH. HH verschilde significant tussen de baltypes ($F_{3,42}=7.403$, $p < 0.05$, $\eta^2=0.346$). Voor de witte bal was de HH-afstand respectievelijk 0.53 en 0.68 m voor linker en rechter balbaan. Voor de andere baltypes varieerde de HH-afstand slechts tussen 0.26 en 0.36 m.

Conclusie: Uit de verschillen die werden gevonden voor HB en HH tussen de baltypes, blijkt toch dat voetballers een efficiënter bewegingspatroon vertonen wanneer de gekleurde ballen werden afgeschoten. Ondank het feit dat de balbaan waarschijnlijk lang genoeg was om zich te kunnen beroepen op prospectieve interceptiestrategieën, blijkt toch dat er betere prestaties worden geleverd met de gekleurde ballen. Er werden echter geen verdere verschillen in de taak tussen de drie gekleurde baltypes onderling gevonden. Het verkorten van de balbaan zou mogelijks het belang van perceptuele aspecten van de voetbal (“edge transition”, kleuren en contrasten) op controle- en interceptietaken kunnen doen toenemen. Verder onderzoek moet dit verduidelijken.

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Differential effect of m. tibialis anterior fatigue on walk-to-run and run-to-walk transition speed in unsteady state locomotion conditions

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Introduction. There are basically two forms of human locomotion, namely walking and running, kinematically distinguished from one to another by presence resp. absence of a double stance phase. When increasing resp. decreasing speed, a gait transition occurs at the point people intuitively feel that it is easier, more naturally to run resp. to walk even though it is possible to walk faster or run slower than the preferred transition speed. [1]. One of the most puzzling aspects of the transition-dilemma is to reveal the reason why gait transitions occur at that specific speed. The purpose of the present study was to examine the role of the m. tibialis anterior -a possible trigger [2]- in a protocol with gradually changing speed before and after fatigue of the m. tibialis anterior. Our hypothesis is that there is a relationship between the m. tibialis anterior and transition speed also in a protocol with gradually changing speed. Muscular fatigue of the dorsiflexors is therefore assumed to affect the transition speed.

Methods. A group of 20 active female human subjects participated in the study after given informed consent. The WRT (walk-to-run transition) and RWT (run-to-walk transition) speed were determined on a treadmill in a protocol with gradually changing speed using high speed video-images (200 Hz) before and after a fatigue protocol, in which the subjects performed submaximal dorsiflexions (ROM: 30°, ±75% 1RPM) until exhaustion was reached. The accelerations used in this research were 0.1 ms⁻², 0.07 ms⁻², 0.05ms⁻² for the WRT and -0.1 ms⁻², -0.07 ms⁻² and -0.05ms⁻² for the RWT. The EMG-signal of m. tibialis anterior was rectified, filtered (bandpass 4-500 Hz) and integrated. EMG-intensity (integral) and duration of the first peak of the m. tibialis anterior (end swing- begin stance) were calculated. A 2 (fatigue) x 3 (acceleration) ANOVA with step number as factor and Post Hoc Tukey tests were used for WRT and RWT to find differences for transition speed, EMG-intensity and duration of the burst of the m. tibialis anterior.

Results and discussion. Transition speed is significantly changed after introducing muscular fatigue. After fatigue, WRT speeds are lower for all accelerations. RWT-speeds do not change, except for the intermediate

Table 1. Transition speed

Acceleration		Transition Speed (ms ⁻¹)	
		Before fatigue	After fatigue
WRT	0.1 ms⁻²	2.16 ± 0.12	2.06 ±
	0.07 ms⁻²	2.10 ± 0.06	2.00 ±
	0.05 ms⁻²	2.12 ± 0.08	2.04 ± 0.09 *
RWT	-0.1 ms⁻²	2.19 ± 0.14	2.19 ± 0.14
	-0.07 ms⁻²	2.12 ± 0.09	2.20 ± 0.14**
	-0.05 ms⁻²	2.17 ± 0.06	2.18 ± 0.06

Asterisk: significant difference between transition speed before and after fatigue ** p<0.01 * p<0.05

deceleration (Table 1). The differential effect of fatigue of the m. tibialis anterior is in agreement with the findings of Prilutsky and Gregor [3]. They claim that WRT is triggered by different muscle groups in comparison to the RWT. Post hoc Tukey tests reveal that tibialis anterior EMG-intensity is higher in the steps around transition (step0) in both WRT and RWT. In the WRT before fatigue EMG-intensity is higher, except for the lowest acceleration and duration is higher for the highest acceleration. In the RWT there is no significant effect, nor for duration nor for EMG-intensity. This might indicate that in the

WRT the m. tibialis anterior is no longer capable of maintaining the desired muscle tension, a combination of both a loss in power and duration, resulting in a higher sense of effort [4] accompanied by a change in locomotion pattern[3].

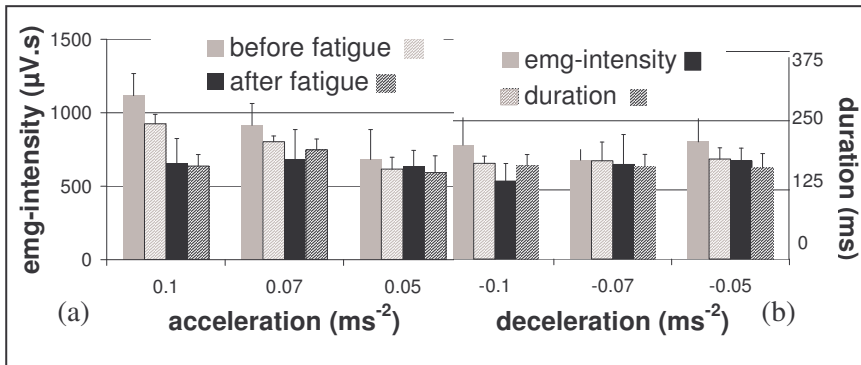


Figure 1: EMG-intensity and duration of energy burst of the m. tibialis anterior for the (a) WRT and (b) RWT

Conclusions

Walk-to-run transition speed is clearly affected by fatigue of the m. tibialis anterior. The increased sense of effort, due to the muscular fatigue, might explain this phenomenon. Further research is necessary since evolution of EMG-intensity on a step to step basis can provide meaningful information.

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Acknowledgements

This research is supported by BOF-UGent B/03796/01- IV1

Does a tailored intervention program delivered through the internet enhance physical activity in adults?

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Introduction:

The internet is often considered as a very promising medium to disperse tailored health information because it can reach large numbers of people at low costs. However there exists little evidence for the efficacy of online tailored interventions.

The purpose of the present study is to evaluate the effectiveness of an online computerised tailored intervention program promoting physical activity (PA) in a small population sample.

Methods:

526 adults (25-55 year) recruited in 6 different work places were randomised in 3 conditions: a tailored PA advice group (TPA), a tailored PA advice supplemented with reinforcement e-mails group (TPA+E) and a waiting-list control group receiving non tailored standard PA information (SPA). PA measurements were collected with the long IPAQ (paper and pencil version) at three times (pre, 3 and 6 months) for all participants. Objective PA measurements were taken in a subgroup (N=60), by wearing an accelerometer during 7 days. Further, a qualitative evaluation of the tailoring program, the reinforcement e-mails and the general PA information was done after 3 months.

Results:

379 participants completed the paper and pencil questionnaire after 6 months. Repeated measures ANOVA were used to examine differences between intervention groups. After 6 months, total group PA levels were significantly higher for total PA ($F=10.951$, $p=0.001$), PA at moderate intensity ($F=9.539$, $p<0.01$) and PA in leisure time ($F=26.554$, $p<0.001$). However no significant time by group interaction effects were found. Accelerometer data did not show significant differences in PA levels between the three groups either. Participants evaluated the tailored PA advice more positive in comparison with the non-tailored standard information. The tailored advice was more read (97 vs 44%), more printed (65 vs 17%) and discussed with others (61.5 vs 32%) in comparison with the standard advice. 86% respondents in the of TPA+E was satisfied about the number and frequency of the reinforcement e-mails. 52% of the inactive participants found the information in the e-mails useful en 41% indicated that it helped them to change their behaviour.

Conclusion:

Despite the positive evaluation of tailored advice and e-mails, no evidence was found that the online computerised tailored intervention program is a better way to enhance PA in comparison with online standard PA information.

Acknowledgements:

The policy Research Centre sport, physical activity and health is supported by the Flemish Government.

The Relative Age Effect: A match-related perspective

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Introduction: Consistent asymmetries in the distributions of birth dates in senior professional and youth soccer (football) players have been interpreted as evidence for systematic discrimination against individuals born shortly before the cut-off date in assigning youth to specific age groups¹. This concept is labeled as the relative age effect.

Methods: The results of a longitudinal study of birth date distributions of 2757 semi-professional and amateur senior soccer players in Belgium are presented. Records for competitive games were available in official statistics provided by the Royal Belgian Football Association.

Results: The Chi-square statistic was used to examine differences between observed and expected birth date distributions. Regression analyses indicated a shift of bias when two different start dates were compared (Fig. 1). Players born in the early part (January-March) of the new age band (2A) were over-represented compared with players born late in the new selection period (October-December). However, players with birthdays at the start of the old selection year (August) were still represented.

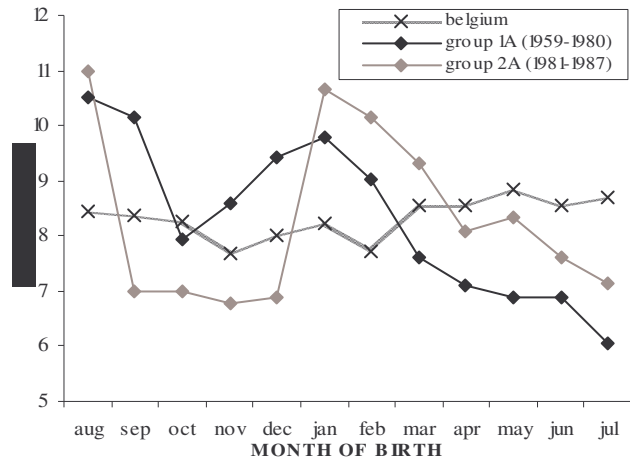
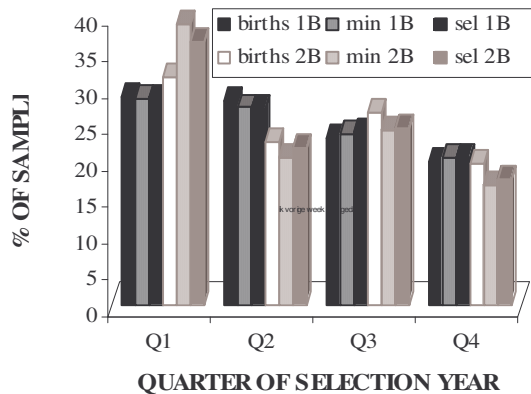


Figure 1. Birth date distributions (%) by age group with comparative data for the Belgian population.

Figure 2. Quarterly distributions (%) of mean number of selections (sel), time played (min) and birth dates (births) by age category.

senior soccer players born in the first quarter of the selected age band received more playing opportunities (Fig. 2). Comparisons of birth date distributions (traditional approach to the relative age effect) with match-related variables gave similar, though not entirely consistent, results. However, there were no differences for the mean number of selections and for playing minutes between players born at the start or the end of the selection year (data not shown).

Conclusions: The data revealed a (shift in the) relative age effect in a semi-professional and amateur senior soccer population and supported the relative age effect for success in soccer. Our findings suggest that match-based variables may provide a more reliable indication of the relative age effect in soccer.

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Analysis of determinant factors in ACSM risk stratification in Flemish adults

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Introduction. The ACSM risk stratification (RS) is a pre-participation screening tool for individuals wanting to become more physically active. It classifies them in a low (L), moderate (M) and high (H) risk group, based on their age, diseases, symptoms and risk factors for coronary artery disease. The M-profile is given to older subjects (men ≥ 45 yrs, women ≥ 55 yrs of age) or those having ≥ 2 risk factors. The H-profile is given to subjects with ≥ 1 disease or symptom (1). The aim of this study was to examine the most determinant factors for being classified in the M- or H-group.

Methods. The ACSM RS was applied to 4201 subjects (2235 men, 1966 women, 18-75 yrs of age) of the research project "Investigation of the current quantitative and qualitative pattern of physical activity, sports participation, physical fitness and general health of the Flemish population", as part of the Policy Research Centre Sport, Physical Activity and Health. All stratification factors were determined through a medical questionnaire or anthropometrically. The resulting M- and H-groups were divided into 2 age groups (men : AG1: <45 yrs, AG2: ≥ 45 yrs of age; women: AG1: <55 yrs, AG2: ≥ 55 yrs of age). For each of these 8 subgroups, frequencies of risk factors (M-groups), symptoms and diseases (H-groups) were calculated.

Results. A total of 868 men (AG1: n=118, AG2: n=750) and 382 women (AG1: n=104, AG2: n=278) were classified in the M-group; in the H-group the numbers were 496 men (AG1: n=116, AG2: n=380) and 574 women (AG1: n=336, AG2: n=238). In AG2 58.8% of the male and 66.9% of the female subjects made part of the M-group only because of their age. In those who were at moderate risk because of 2 or more risk factors, more than 70% had a combination of exactly 2 risk factors (see Table 1). Hypertension was an important risk factor (67.8% and 51% in young men and women, 49.6% and 49.3% in older men and women, respectively). In the H-group the number of disease-free subjects is much higher than the number of asymptomatic subjects, except for the older males (see Table 2). The prevalence of heart disease is rather high in the entire H-group (12.9% and 16.1% in young men and women, 39.8% and 27.7% in older men and women, respectively).

	AG1		AG2	
	Men	Women	Men	Women
2 risk fact's	73.7%	71.2%	76.1%	71.7%
3 risk fact's	24.6%	25.0%	18.4%	25.0%
4 risk fact's	1.7%	3.8%	5.2%	3.3%
5 risk fact's	0.0%	0.0%	0.3%	0.0%

TABLE 1. M profile: division of subjects according to number of risk factors, for age and sex.

	AG1		AG2	
	Men	Women	Men	Women
no disease(s)	50.0%	47.6%	25.3%	32.8%
no symptom(s)	26.7%	24.7%	36.6%	26.1%

TABLE 2. H profile: division of subjects according to absence of disease or absence of symptoms, for age and sex.

Conclusion. The most determinant factors for being classified in the M-group are (i) age and (ii) a combination of 2 risk factors. For classification in the H-group, (i) the presence of 1 or more symptoms is a more determinant factor for women and younger men, (ii) for older men the presence of 1 or more diseases is more predominant.

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Acknowledgement: The Policy Research Centre Sport, Physical Activity and Health is supported by the Flemish Government.

Quadriceps and hamstrings strength are related to vitamin D receptor genotype in young-adult males

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Introduction: The vitamin D receptor (VDR) gene has been extensively studied in relation to bone mineral density, due to the important role of vitamin D in bone metabolism. Despite the fact that vitamin D is also known to be important in muscle cell metabolism¹, until now only a few studies have investigated the association of VDR gene polymorphisms and muscle strength^{2,3}. Purpose of the study: To investigate the association between the BsmI, TaqI and FokI polymorphisms in VDR and muscle strength in healthy, young-adult males.

Methods: The sample comprises 370 male Caucasian siblings (aged 17-36) selected from the larger Leuven Genes for Muscular Strength project. Single nucleotide polymorphisms were analysed using the Sequenom MassArray platform (B and b denote absence and presence of the BsmI restriction site. Similarly for TaqI, FokI). Knee strength was evaluated using the Cybex NORM dynamometer (Lumex Inc., NY). Peak torque over the complete range of motion (0-90°) of concentric knee extension (quadriceps) and flexion (hamstrings) were measured at 60°/s, 120°/s and 240°/s. During these contractions, torque at specific angles (30° and 60°) was also recorded. Hand grip was measured by use of a JAMAR dynamometer (Sammons, Preston). Statistical analysis was done by analysis of variance (AN(C)OVA) using SAS software. Level of significance was set at p<0.05.

Results: No association was found between any of the polymorphisms and handgrip strength. No association was found either between FokI (FF 37.1%, Ff 45.5%, ff 17.4%) and any of the strength phenotypes measured. Association with quadriceps strength was significant for TaqI (tt 16%, tT 48.5%, TT 35.5%) at a speed of 240°/s at 30° after correction for estimated muscle and bone cross-sectional area (MBA) (p=0.0328). Individuals with the tT genotype had ca 6% higher quadriceps strength than TT individuals (p=0.01). The BsmI genotype (BB 16.6%, Bb 48.6%, bb 34.8%) was associated with hamstrings strength measured at an angle of 60° at speeds of 60°/s and 120°/s when taking MBA into account (p=0.0299). Bb individuals had ca 5% higher hamstrings strength than BB or bb individuals (p<=0.0485). The TaqI polymorphism showed association with hamstrings strength measured at 60° over the complete speed range (all p<0.04), even after correction for MBA. tT carriers had 4.3-7.4% higher hamstrings strength than tt or TT individuals (p<=0.037).

Discussion: To our knowledge this is the first study to investigate the association between VDR gene polymorphisms and strength phenotypes in a male sample. Other studies mainly focused on women, due to the known effect of vitamin D receptor polymorphisms on bone mineral density and its relationship with osteoporosis. Geusens et al^{2,4} observed a significant association between the BsmI genotype and quadriceps and grip strength in elderly non-obese women (25% and 7% lower in BB compared with bb genotype, respectively). Grundberg³ et al on the other hand could not replicate significant associations between BsmI genotype and quadriceps and handgrip strength in adult women. They did however observe a marginally significant correlation of the BsmI genotype and hamstrings strength after correction for age, fat mass and lean mass, with BB having the highest strength, followed by Bb and bb. Our data also suggest an association of the BsmI genotype with hamstrings strength in young adult males, albeit with Bb having higher strength than BB and bb. In addition an association is suggested between the TaqI genotype and quadriceps strength, with the heterozygous tT individuals having the highest strength. For now, no direct functional role is known for these two non-coding polymorphisms. One possibility is that they are in linkage disequilibrium with unknown functional SNPs. No association was found between FokI and any of the measured strength phenotypes. This is surprising as FokI is one of the few known functional polymorphisms in the VDR gene. Further research regarding these polymorphisms might elucidate these findings.

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