# Sport Performance at the Oslo Conference of the European College of Sport Science

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This conference was noteworthy for the focus on sport and exercise science and the youthful enthusiasm of the attendees. Don't miss the 2010 meeting in Turkey. Acute Effects: choking in penalty shoot-outs; benefits of pre-cooling, sodium loading, post-activation potentiation, and warm-ups; no benefit of compression garments. Coaching: coach-captain relationship, athlete autonomy. Injury: effects of skill, fitness, age, maturity, and exercise interventions. Match Analysis: volleyball, basketball, futsal, rugby union, small-sided soccer. Motion Analysis: sprinting, discus, javelin, running. Nutrition: the good and bad of training and competing with carbohydrate and antioxidant supplementation; benefits of chronic protein during weight loss, chronic L-arginine for sprinting, acute bicarbonate for sprinting, acute caffeine for sprint swimming, acute taurine for running, and water intake for surfing; possible benefit of an adaptogen. Statistical Modeling: the challenge of complex systems; a poorly performing neural net; a new training-performance model; mixed or general linear modeling to track performance in a squad; converting validity statistics between populations. Tests and Technology: height predicts basketball outcome; a test for soccer goalkeepers; real-time boat kinetics in rowing; reliable endurance cycling tests; many others. Training: successful psych interventions with gymnasts and biathletes; a place for long-slow distance; successful high-intensity interval training; strength training for endurance; shorter recovery time between sprints and resistance sets; resistance training for football kicking; complex training for soccer; rhythmic training for futsal; rope jumping for volleyball; live-low train-high needs live-high; little effect of inspiratory muscle training; a meta-analysis for optimized plyometrics; recovery heart rate to monitor overstrain.
KEYWORDS: complex systems, elite athletes, ergogenic aids, nutrition, tests, training.

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This year I stayed away from the American College of Sports Medicine and attended instead my first meeting of the European College of Sport Science, the Oslo meeting, June 24-27. An added lure was the experience of midsummer in Oslo, where the sky stays bright at midnight. Oslo turned out to be a charming old city bathed in brilliant warm sunshine all week, and the streets were safe. The Nordic princes and princesses were also charming.

The conference got off to a shaky start with problematic poster sessions and a book of abstracts that was hard to read. These issues will be easy to fix next time, and they were more than offset in Oslo by the camaraderie and shared aspirations of the crowds of enthusiastic, talented, young sport scientists in attendance. The conference also provided me with valuable new contacts in Europe and an opportunity to promote my statistical heresies. Best of all, on the last day I was there for a presentation of novel research that might lead to an effective strategy for athletes to optimize their training. I have high expectations for the next ECSS meeting, in Antalya, Turkey, 23-26 June 2010.

In the following report I have identified presentations by the family name of the first author. Find the abstract by copying the name and any initial shown into the Search form rather than the Find form in the PDF of abstracts, which was still free for anyone to download when I wrote this article. If it is no longer available, contact me.

As in my ACSM reports, I have reviewed most of the oral and poster presentations on athletic performance, especially interventions aimed at factors affecting performance. I have skipped most of the observational or correlational studies, especially where (as usual) the sample size was too small to make any useful conclusion. In case I have missed something important in such studies or in studies outside my areas of expertise, I advise anyone with an interest in a specific sport to search the PDF using the name of that sport. Those of you with an interest in population physical activity and health should also search the PDF for key terms (e.g., the terms *accelerometer*, *obesity* and *elderly* occur in ~20, 50 and 60 abstracts).

This was a large meeting, with up to 10 concurrent oral sessions and 26 (!) concurrent author-presented chaired poster sessions. Consequently I got to see only a fraction of the oral sessions, and I spoke with practically no poster presenters, so I have had to base most of this report only on the abstracts. My frustration with the generally poor reporting therein is sometimes apparent. Please, avoid acronyms and abbreviations, show an effect statistic with its uncertainty as confidence limits, and interpret the magnitude of the outcome accordingly (e.g., *possibly small enhancement, trivial but unclear correlation, clear harmful effect…*).

### Acute Effects

The higher your status, the more you **choke** in **football** penalty shootouts (Jordet).

**Precooling** with an ice jacket improved 1500-m **swimming** time by 2.6% in a crossover with 4 male and 4 female triathletes (Kocjan). Use of ice jackets also enhanced 40-min cycling power by 11% at 33 °C in a crossover with 8 male **cyclists** (Duffield).

**Pre-cooling** by ingestion of crushed ice enhanced 40-km **cycling** time-trial time in a warm environment (30 °C) by 6.5% with 7 trained males in a crossover (Peeling).

**Pre-cooling** and **sodium loading** with cold drinks had simple additive effects on endurance performance in a warm environment (32 °C) in 18 average **cyclists** (Truelove).

"Energicer" **cooling** sleeves and vest apparently had little–or more likely an unclear–effect on incremental **cycling** time to exhaustion at 35 °C (Hohenauer), but maybe my stats would show clear differences, or maybe the unstated performance time wasn't long enough for heat to be a real issue.

A study of the effects of a brief bout of heavy resistance exercise on subsequent **cycling** sprints showed the time course of **post-activation potentiation** beautifully, with a peak around 10 min (Thatcher, R).

A **warm-up** enhanced performance of a **cycling** sprint test, but adding some sprints to the warm-up didn't increase the benefit (Wahl, P).

**Compression garments** (socks, tights, whole body) possibly impaired a **run** to exhaustion in a crossover with 14 endurance-trained athletes (Haegele).

### Coaching

A qualitative case study of a successful **football coach-captain relationship** (Johansen, B) left me wondering, as always, about the generalizability of such studies. The same author left no such doubts in a very thorough quantitative survey of 149 elite coaches on a similar topic, but there was no interpretation of magnitude and no suggested practical application for all the reported correlations and differences in means with the eight psychometric scales.

A qualitative study of 20 top coaches and athletes in a national **team sport** underscored the importance of **empowerment** and **athlete autonomy**, and engaging with the question "what can make us better?" (Hemmestad).

### Injury

Junior **soccer** players with more **skill** and **fitness** lost *more* time to injuries, presumably adjusted for exposure (Severino).

An apparently retrospective study of 125 adolescent **soccer** players revealed effects of various measures of **age** and **maturity** on risk of overuse and acute injuries (Norikazu).

A meta-analysis of randomized controlled trials revealed a halving of injury risk with **exercise interventions** (balance training, stretching, plyometrics, etc.) in young adult athletes playing **ball sports** (Hübscher).

### Match Analysis

Analysis of **volleyball game statistics** produced several predictors of score difference (João, P; two abstracts; a bug makes the search fail when you include the P). Analyses of **basketball tactics** (Tsamourtzis) and **player dynamics** (Bourbousson) look useful, as does analysis of **player actions** in a female **futsal** final (Benvenuti).

Discriminant function analysis was used to identify frequencies of events that predict **winning** in 159 close games at Super12 and IRB **rugby union** (Vaz, L).

Use of dynamical systems theory applied to only 66 **goal-scoring** opportunities with 10 players of small-sided **soccer** games showed that "encouraging attackers to take initiative increases the chance to score" (Frencken).

### Motion Analysis

Kinematic analyses of **sprinting** (Kijima; Fukuda, K), **discus** throw (Yamamoto, D) and **javelin** throw (Tazuke) might give you ideas for performance enhancement.

Four practically identical abstracts of the kinematics of 800-m and 1500-m male and female **runners** (Hayes; Caplan) should have been submitted differently.

### Nutrition

Here's the current status of training on low **carbohydrate** and competing on high carbohydrate: "metabolic adaptations could be beneficial in the long term", but "training low and competing high could compromise high-intensity performance, increase symptoms of over-reaching and suppress immune function" (Jeukendrup, no abstract).

In a symposium presentation on **antioxidants** (Philp), the evidence presented is consistent with impairment of training adaptations with chronic use of dietary antioxidants (they blunt the body's adaptive response to reactive oxygen species produced in exercise) but possible ergogenic effects from acute use (they reduce the damaging effect of reactive oxygen species).

Indeed, 6 wk of an **antioxidant** multivitamin supplement reduced gains in VO2max in a randomized placebo-controlled trial with 40 amateur **soccer** players (Skaug, A).

**Protein** intake was important to maintain lean mass during weight loss in a controlled trial of 10+10 resistance-trained athletes (Mettler).

**L-arginine** supplementation for 3 wk improved sprint speed by 2.5% in a controlled trial of 16 male and female trained **runners** (Zacharogiannis).

**Bicarbonate** supplementation resulted in less decline in a third and fourth 30-s sprint (18%, 21%) compared with placebo (24%, 30%) in a crossover with 8 male **cyclists** (Zinner). And from a study of various supplementation protocols, "NaHCO3 should be ingested 120-150 min prior to exercise to induce substantial blood alkalosis, and NaHCO3 co-ingested with a high-carbohydrate meal may reduce GI symptoms" (Carr, A).

Elite **swimmers** taking 100 mg of **caffeine** in a blind crossover performed 1.2% faster in training time trials and by 1.4% in competition time trials. The authors used mixed linear modeling to track performance in the squad of 3 females and 6 males over 9 wk and to estimate and adjust for gradual performance improvements with each swimmer, faster swimming in competition vs training time trials (1.4%) and faster swims in evenings vs mornings (0.6%) (Hopkins, W).

Six male middle-distance **runners** performed a 3-km time trial 1% faster on average in a crossover comparing acute ingestion of 1 g of **taurine** with placebo, but it was "p>0.05" (Balshaw).

**Surfing** performance over 100 min was substantially better when surfers consumed **water** every 20 min compared with no consumption (Ali, A). I guess it could be due to a placebo effect.

Supplementation with an extract of the **adaptogen** plant Rhodiola rosea looks like it might enhance the effects of endurance training on VO2max (5.3%) and possibly peak **running** speed (0.9%) compared with a placebo in one study (Vieillevoye), but there was little effect in another study (Duranti).

### Statistical Modeling

A symposium on **complex systems** (Vainoras; Hristovski, a no-show; Araujo, D) left me wondering whether this emerging science is ready to make practical contributions to sport. The one important take-home message from Araujo for me was that we have to synthesize variables at a level above those of traditional notational analysis if we are to capture the complexity of games usefully.

There were several presentations based on techniques for the analysis of **complex systems**. I sometimes had difficulty understanding the jargon and making the link between the statistics and the actual events in the sport. Try your luck with abstracts on aiming in **biathlon** (Baca), technique and balance in **judo** (Rodríguez-Romo, but PDF search works for Rodríguez only), interactions in **beach volleyball** (Koch, C), **small-sided soccer** (Frencken) and **basketball** (Bourbousson), and **physiological factors** in performance (Esteves, D)

A **neural-net** model of daily endurance training and performance over 4 wk in an unstated number and type of athletes did not predict future performance well (Haar).

A **performance-potential model** was presented as a rival to the Bannister fitness-fatigue model for predicting effects of on-going training on performance (Pfeiffer; two abstracts).

**Mixed linear modeling** is a useful approach for tracking performance in a small squad of athletes who compete as individuals (Hopkins, W). Not stated in the abstract is the fact that a mixed model is necessary only if the typical error changes or differs within or between athletes; otherwise use the general linear model.

**Validity statistics** derived by regression in one population can now be converted to appropriate values for another population differing in mean or standard deviation (Hopkins, W).

### Tests and Technology

Mean team **height** is a predictor of outcome in under-20 female **basketball** games at international level (Russo).

A **test battery** for **soccer** goalkeepers looks interesting but needs a much bigger validation sample size (Knoop).

Good presentation of stroke-by-stroke **boat kinetics** in real time is a valuable tool for **rowers** (Draper).

By using elite **cyclists** and by being careful about pre-test preparation, you can get really low 1-wk typical errors of measurement: **incremental peak power**, 0.9%; **40-km mean power**, 1.7%; 40-km time, 0.7% (Lamberts).

There were many other presentations on measurement properties of sport-specific **tests and measurements**. Some of these will be useful for your athletes; find them by searching with the name of your sport.

### Training

Psychological interventions are rare, but there were two at this conference. A controlled (presumably randomized) trial of a psychological intervention, **cognitive behavioral training** was aimed at reducing competition anxiety in 5+5 adolescent **gymnasts**. "The intervention group showed significant improvements in performance on the balance beam along with reduced cognitive and somatic anxiety and increased confidence; the control group showed no improvements" (Smyth). The authors admitted it could be due to a placebo effect. Impressive, nevertheless, but show more data next time, please! In another controlled trial, "**applied tension release training**" for 11 wk improved the shooting accuracy of 7+5 national-level **biathletes** by a presumably massive 11% (Laaksonen, M).

**Long slow distance** still has a place in preparing the athlete to tolerate high-intensity training (Martin, D; Seiler, S).

**High-intensity interval** training using a parachute for resistance in 12 sessions over 4 wk improved sprint performance by an unstated amount in a controlled trial of 8+8 **runners** (Smirniotou).

**High-intensity intervals** for several weeks worked really well in a controlled trial of junior **skiers** (Breil) and produced huge gains in VO2max (up to 10%, but uncontrolled) in already well-trained **skiers** (Vogt, M).

Not surprisingly, a 10-wk program of **high-intensity** low-volume training worked better than **low-intensity** high-volume training in 13+13 well-trained male middle-distance **runners** (Enoksen).

In a 9-month randomized controlled trial of 16+16 **runners**, **intervals** at one of two intensities (VO2max vs half-way between VO2max and ventilatory threshold) made little difference to improvements in 1500-m and 5000-m times (Loucaides; a no-show).

Professional **footballers** gained equally from high-intensity **intervals vs endurance** runs during a 5-wk preparation phase of training (Faude).

**Strength training** appeared to have little benefit on sprint or endurance performance in elite **cross-country skiers** (Losnegard). Maybe the training needs to be more specific to the movements of the sport. It appears to be beneficial for **ski jumping** (Kojedal).

Heavy **strength training** probably enhanced endurance performance in a controlled trial of 11+9 **cyclists**, but it's hard to tell from the way the stats were reported (Rønnestad).

It looks like **strength training** is worth including early on in a periodized program for **runners**, but the abstract is not an easy read (Taipale).

I was a bit surprised that a 10-s **recovery** between pairs of 80-m **running** sprints gave greater gains in sprint performance than 1-min recoveries in an 8-wk program, considering there were only 7 moderately trained males in each group (Bogdanis). But maybe it's true, because a shorter time (~1 min) between **resistance-training** sets, as determined by recovery heart rate, resulted in higher post-session testosterones and twice the strength gains compared with the usual recovery time (2 min) in a controlled trial with 21 men training 3 times per week over 7 wk (Piirainen).

**Resistance** training twice a week for 6.5 h in total over an unstated period increased the speed of the instep kick in a controlled trial of 4+4 elite **footballers** (Malý).

Ten weeks of once-a-week **complex vs repeated sprints** training in a controlled trial of 7+7 young elite **soccer** players produced some differences in fitness tests (Buchheit).

A controlled trial of "**rhythmic training**" in 8+8 female **futsal** players for 16 wk improved "free for marking" skill (Iannarilli).

Adding **rope jumping** and especially weighted rope jumping to a 12-week training program improved anaerobic power and agility in a controlled trial of 25 female **volleyball** players (Colakoglu).

Training at simulated high **altitude** (in hypoxia) needed the addition of living high to produce substantial gains in a 3-wk controlled trial of 17 well-trained male and female **runners**; the gains were gone 2 wk later (Robertson, E).

In a controlled trial with 14 **cyclists**, intervals in **hypoxia** (live-low train-high) enhanced performance in hypoxia but impaired performance in normoxia compared with similar intervals (at lower intensity) done in normoxia, although the effects were "not significant" (Lecoultre).

**Inspiratory muscle training** didn't enhance incremental peak power relative to control in 8+8 healthy males (Keramidas).

A substantial amount of the change in performance in VO2max and a repeated-sprint test after the first 7 wk of a season was explained by differences in **training load** between 31 **football** players of unstated level; age and pre-season factors had little effect (Impellizzeri).

A meta-analysis of the effects of **plyometric training** on strength revealed optimum program characteristics (10 wk, 15 sessions, >40 jumps per session, high intensity, combining different kinds with weight training but not with added weights); benefits are also independent of fitness level and sex (Saez-saez de Villarreal).

And now my choice of the presentations… Slower **recovery of heart rate** in over-reached or overtrained athletes is an old idea, but Robert Lamberts with a group from Cape Town presented data to show that it might be useful to optimize training load and avoid overtraining. They pushed 14 well-trained **cyclists** with 8 high-intensity training sessions over 4 wk, followed by a 10-d taper, with a 40-km time trial pre and post. They measured heart-rate recovery in the minute following the last interval of each session. The cyclists who showed gradual increases in recovery over the 4 wk had about twice the gain in mean power in the time trial (8.0% ± 2.8%, mean ± SD) as those whose recovery deteriorated in the last two weeks (3.8% ± 2.4%). The correlation between the changes in power and recovery was also high (0.80), but perhaps not as high as you would like for use of heart-rate recovery alone to adjust training. As Robert pointed out to me in a subsequent email, other indicators will need to be included, and they are now doing such a study. Maybe we will see the outcome at the ECSS meeting next year.

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