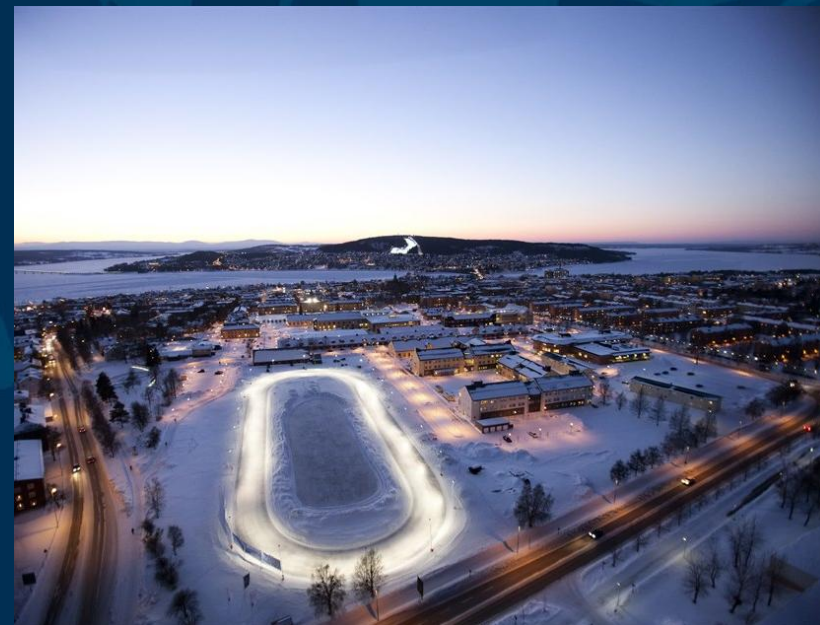


Demands of World-Class Sports and The Scientific Support Behind Athlete Preparation

Glenn Björklund, PhD

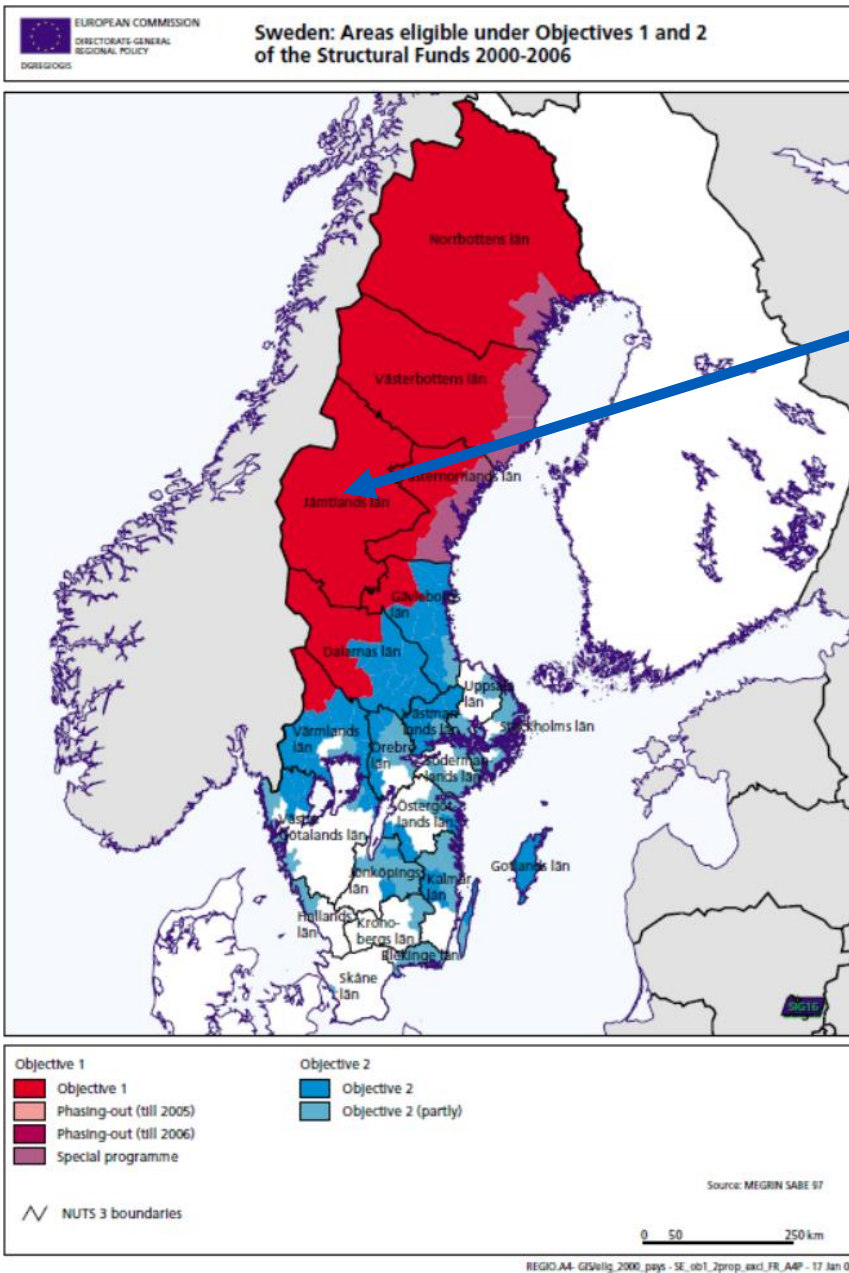
Director of Swedish Winter Sports Research Centre

Associate Professor in Sports Science, Department of Health Sciences,
Mid Sweden University



Short bakgrund: Why Östersund?

- Sweden has **applied to host the Winter Olympics seven times but** has never been awarded the Games. The bids were:
- **1984** – Gothenburg (finished third)
- **1988** – Falun (runner-up, lost to Calgary)
- **1992** – Falun (third place, lost to Albertville)
- **1994** – Östersund (runner-up, lost to Lillehammer)
- **1998** – Östersund (third place, lost to Nagano)
- **2002** – Östersund (runner-up, lost to Salt Lake City)
- **2026** – Stockholm-Åre (runner-up, lost to Milan-Cortina)
- 👉 So in total: **7 bids, 0 wins.**

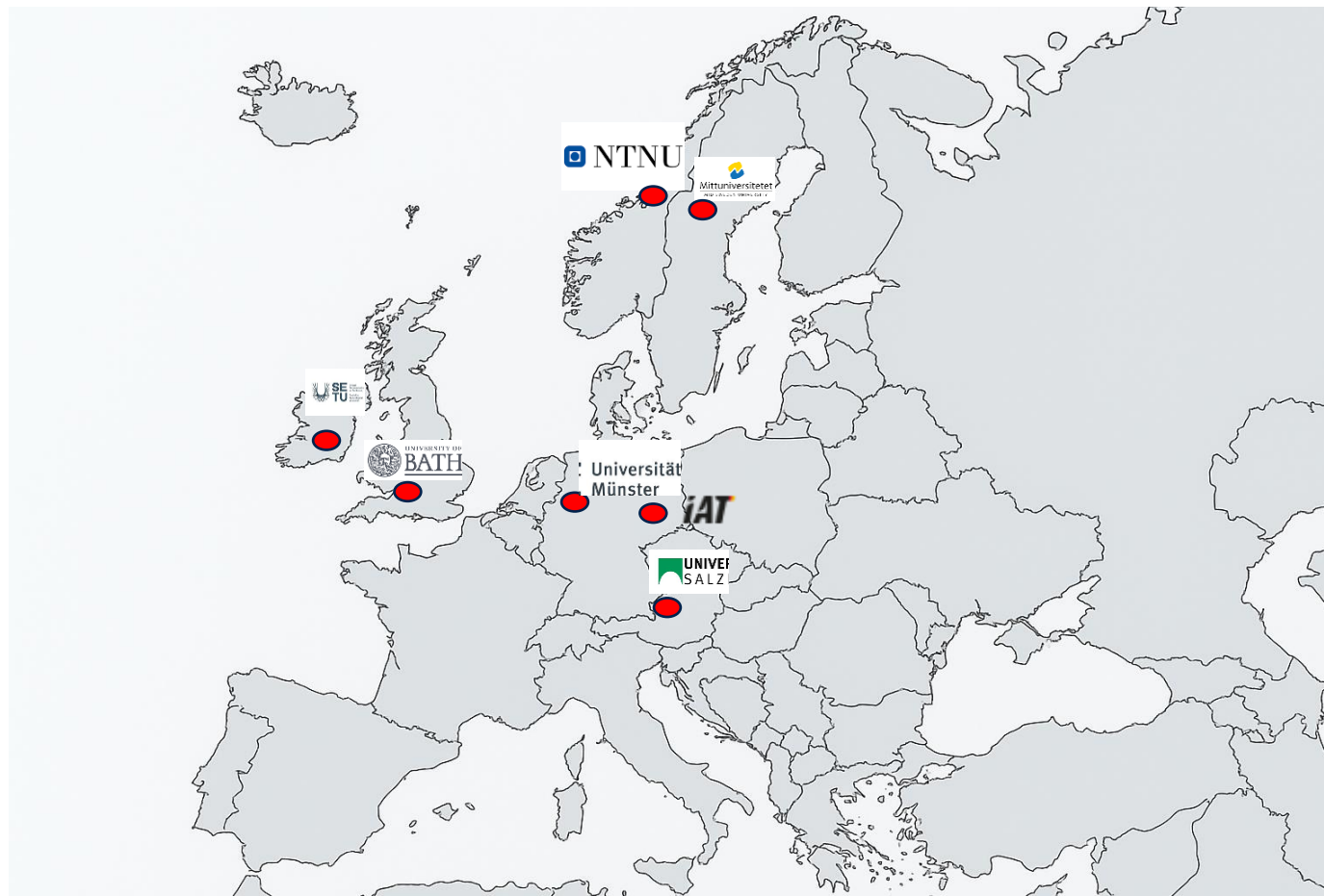


European Regional Development Fund

Östersund – Rural area in Sweden



Examples of European Internship and Collaboration Partners



SAVE THE DATE:
22-24 APRIL 2026
NORDIC WINTER
SPORTS CONFERENCE

Place: Trondheim, Norway
Website: nordicwintersportsconference.com



Connecting
science and
practice to
enhance
performance in
Olympic and
Paralympic winter
sports

Further
information will
soon be provided
on our website

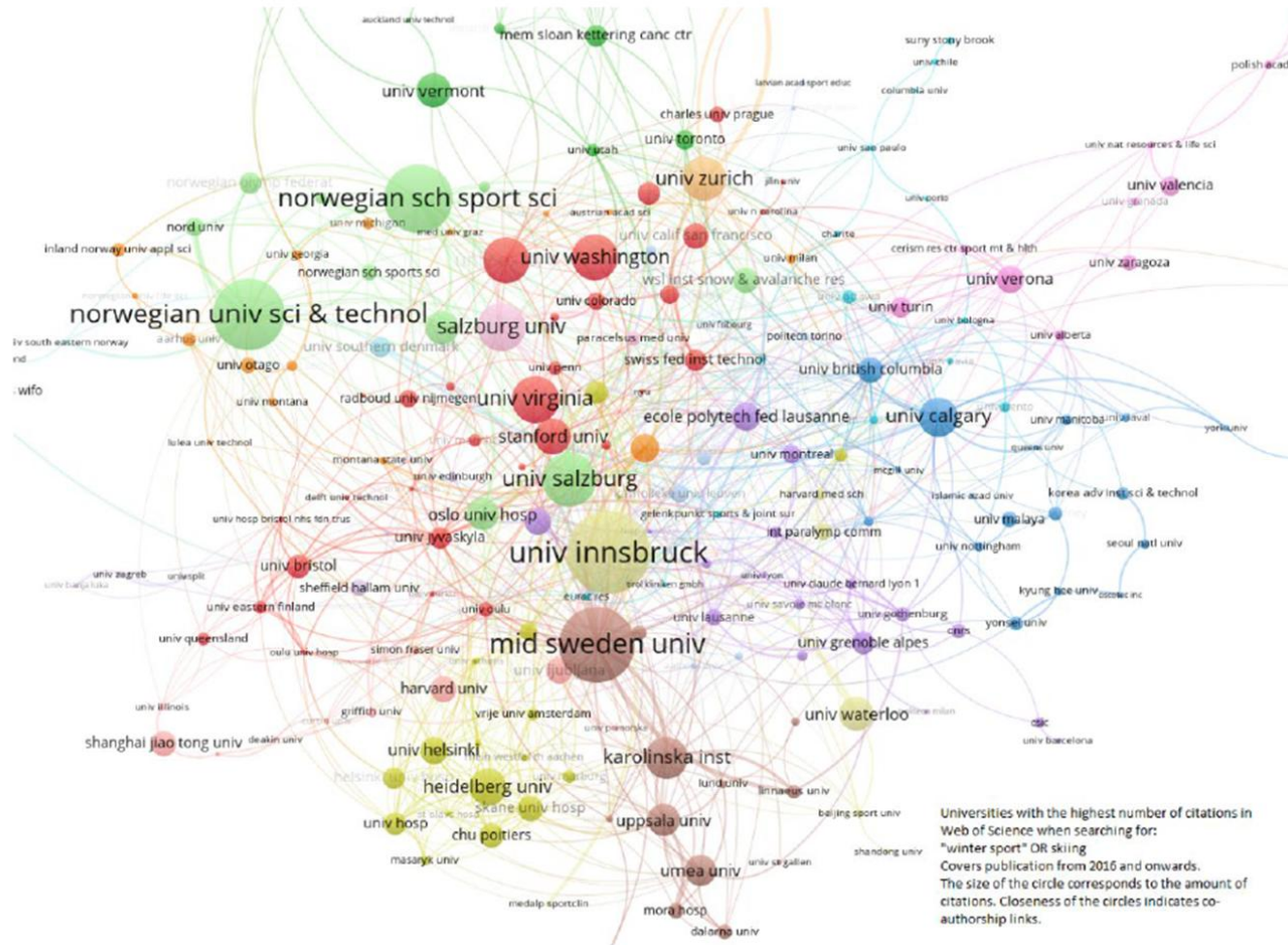
NWSC ORGANIZING
COMMITTEE

Centre for Elite Sports
Research, Norwegian
University of Science and
Technology

Department of Sport
Science, Nord University

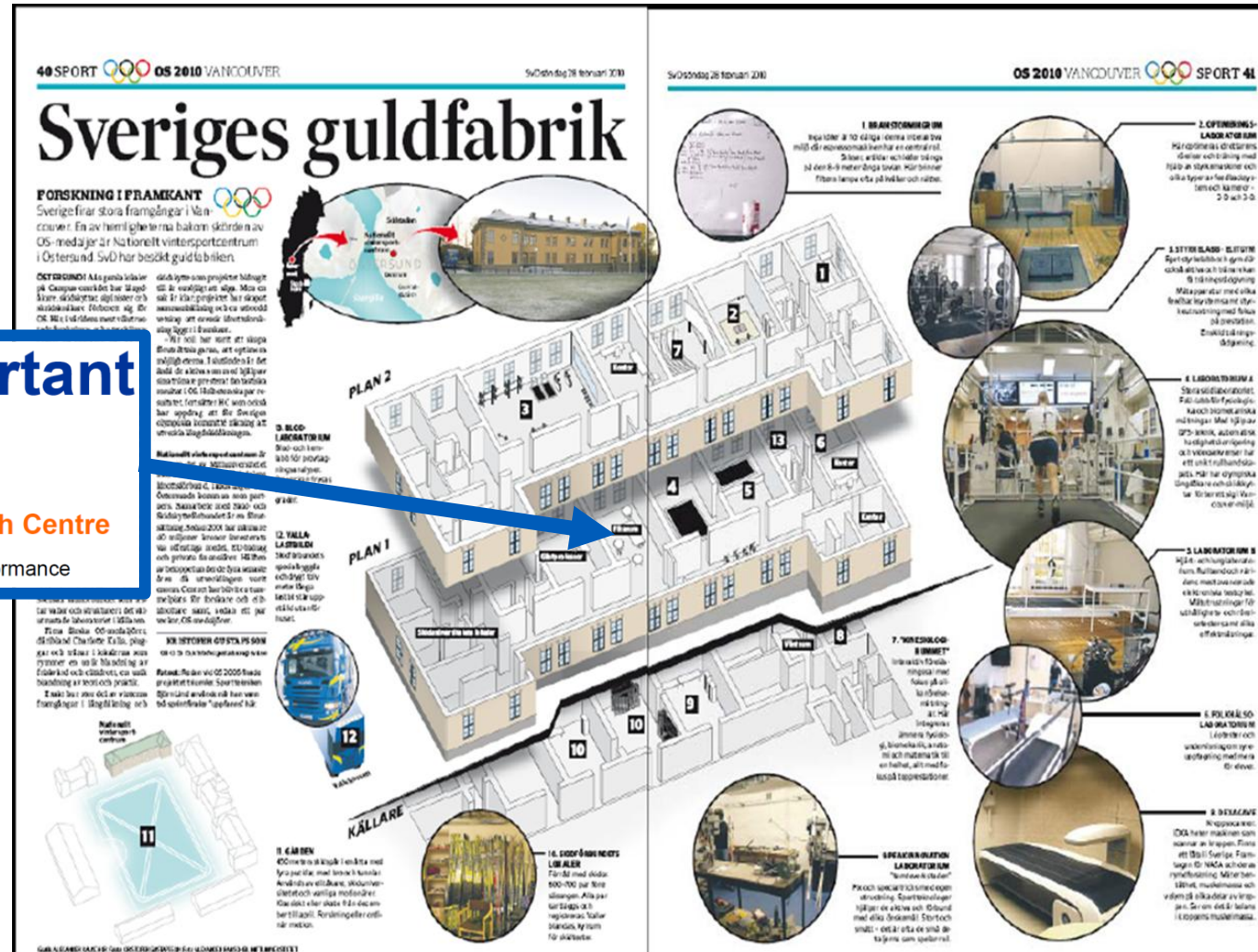
Swedish Winter Sports
Research Centre, Mid
Sweden University

Research partner and collaborating universities n = 132



The Most Important Room

Advancing sports science, testing & performance



Swedish Medalist 2022 Beijing Winter Olympics

- Gold: 8
- Silver: 5
- Bronze: 5
- Best performance ever (for Winter Games)
- Sweden ranked **5th** in the overall medal table in 2022.



Swedish medals at WC in Cross Country skiing and Biathlon 2025

- 🥇 6 Gold
- 🥈 1 Silver
- 🥉 4 Bronze



- 🥇 1 Gold
- 🥈 2 Silver
- 🥉 1 Bronze



Ski University to Sports Academy: Dual careers

- **Combining Academic Studies with Elite Sports**
- **Wall of Fame:** World Championship and Olympic medalists who studied at Mid Sweden University
- **Over 130 students** are currently enrolled at the Mid Sweden University Sports Academy



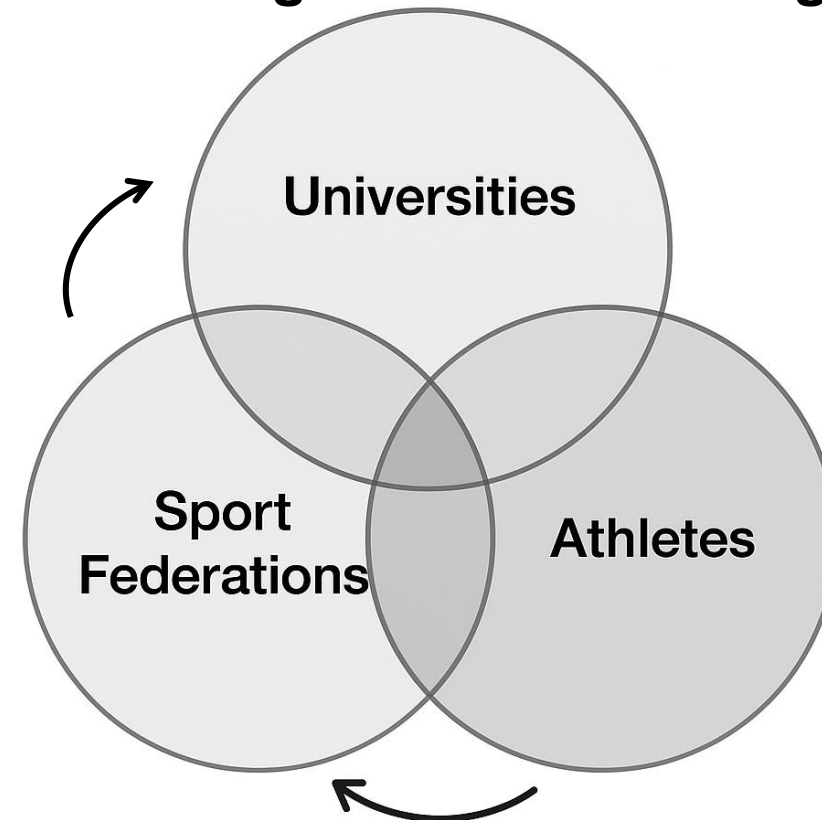
Keys to cooperate with federations, coaches and athletes

Challenges to understand each others primary tasks



Universities vs Elite Sport in Sweden: Different agendas and fundings

- Governmental and research fundings
- Research and education first and foremost
- Public outreach with surrounding society



Different Timelines in Sports Science and Practice

Sports Science (Academy)

From study start to publication: several years. Delay: months to years.

Coaches

Need quick answers. Direct responses without long interpretation. Delay: days to weeks.

Athletes

Need immediate solutions to train without problems. Delay: hours.

Best practice: When/How do you communicate your research in an applied setting?



RELEVANCE



BUILD TRUST



PROACTIVE
DISSEMANATION



FOCUS ON
ACTIONABLE
INSIGHTS



CORRECTNESS –
HOW CORRECT
CAN YOU BE?



Riksidrottsförbundet

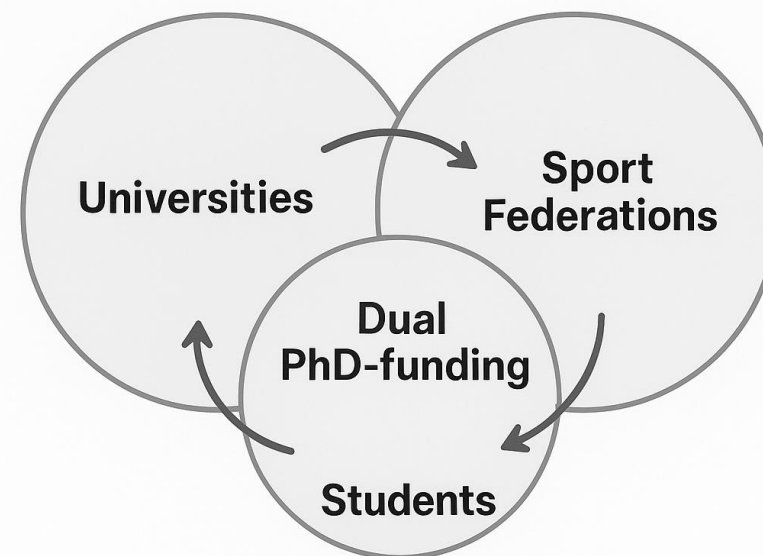
Extract from the Swedish Sports Confederation elite sports #2030

- **A stronger connection to sports research that is sufficiently robust, practice-oriented, and applicable to elite sports.** This, in turn, should generate qualified competence support for coaches and other leaders across multiple domains.
- An enhanced and further developed coach and leadership development program grounded in practice-oriented elite sports research.
- **Adequate and strengthened development environments for athletes' training and competition, combined with educational opportunities** (enabling the pursuit of a dual career) at both upper-secondary and post-secondary levels.

Dual careers as PhD Students: Applied research within the sport

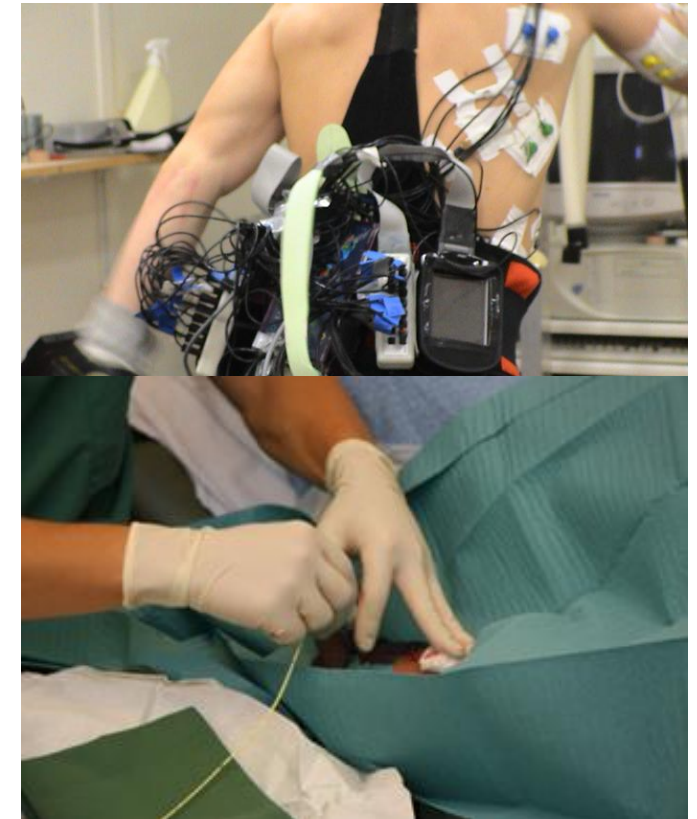


Andreas Kårström, Karin Hägglund, Lina Spetz, Jonas Engqvist, Stefan Höög, Martina Höök.
FOTO: Pelle Fredriksson



From Theory to Practice: Sports Science Advancements Since 2002

Exercise Physiology – Applied Biomechanics



From the laboratory to..

- **Research themes**
- Performance Optimization in Endurance and Technical Sports
- Physiology and Environmental Stressors
- Gender, Inclusion, and Fairness in Sport
- Female Athlete Health and Menstrual Cycle Research
- Sport Science Methodology and Frameworks
- Athlete Development, Psychology, and Social Factors



Translating Sports Science into Practice

Enhancing Athletic Potential Through Science



**INSIGHTS FROM GROUP
AND INDIVIDUAL DATA**



USE COMBINED DATA TO
TAILOR TRAINING
STRATEGIES.



RECOGNIZE PATTERNS
THAT SUPPORT BOTH
TEAM-WIDE AND
PERSONAL DEVELOPMENT.



KEYS TO UNLOCK
POTENTIALS

Single projects that combine strong academic relevance with clear implications for sports performance.

- **Initiators:**
- Coaches from federations and sports associations
- Researchers with a strong orientation toward applied science
- Embedded scientist



Guldvapnet: "Kängurun"

Publicerad 27 feb 2006 kl 12.16

Uppdaterad 27 maj 2016 kl 01.31

TURIN. Efter 18 års väntan hade Sverige äntligen fått ett OS-guld i längdskidåkning.



Contribution of the Legs to Double-Poling Performance in Elite Cross-Country Skiers

HANS-CHRISTER HOLMBERG¹, STEFAN LINDINGER^{2,3}, THOMAS STÖGGL^{2,3}, GLENN BJÖRKLUND^{4,5},
and ERICH MÜLLER^{2,3}

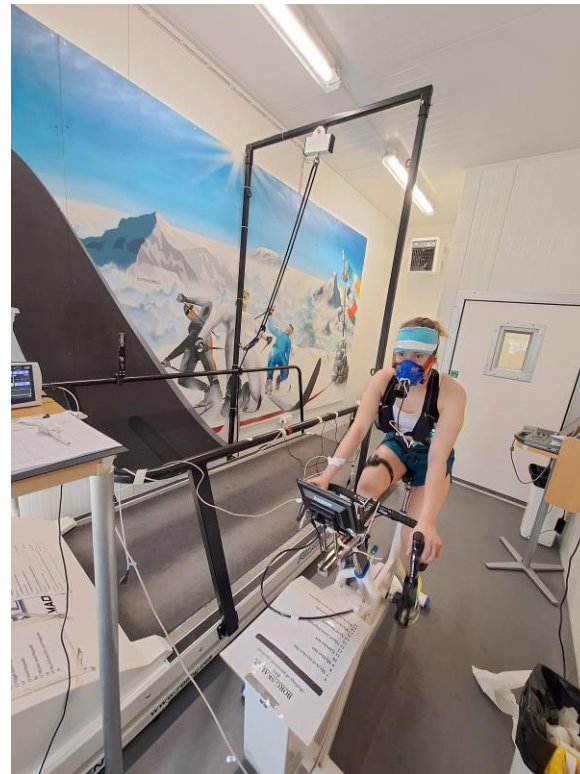
¹Department of Physiology and Pharmacology, Karolinska Institute, Stockholm, SWEDEN; ²Department of Sport Science and Kinesiology, University of Salzburg, AUSTRIA; ³Christian Doppler Laboratory, AUSTRIA; ⁴Department of Natural Sciences, Mid University, Östersund, SWEDEN; and ⁵National Winter Sport Centre, Östersund, SWEDEN

10.9% lower relative pole force in DP_{LOCKED} (all $P < 0.05$). **Conclusions:** Movements of the knee and ankle joints are an integrative part in the skillful use of the DP technique, and restriction of the motion in these joints markedly affects both biomechanical and physiological variables, impairing DP performance. **Key Words:** CROSS-COUNTRY SKIING, KINEMATICS, KINETICS, PEAK

Hypoxic Tolerance: From Fundamental Mechanisms to Sporting Performance



Dr. Pontus Holmström





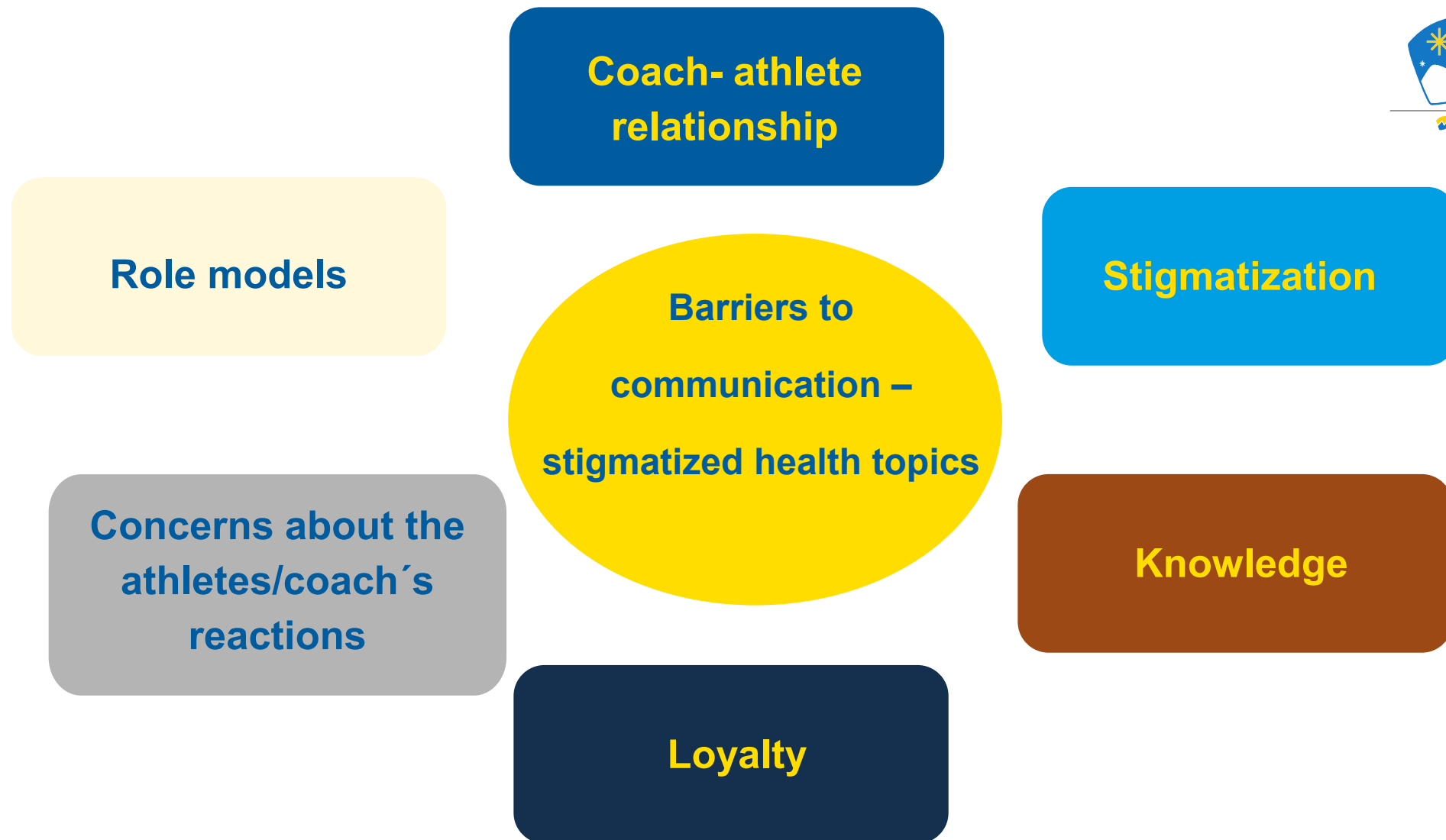
**SVENSKA
SKIDFÖRBUNDET®**
SWEDISH SKI ASSOCIATION



Collaboration with Swedish Ski Association

- Swedish Ski Association – Cross Country Skiing
- Embedded Scientist – Dr Öyvind Karlsson
- Embedded PhD Student – Martina Höök 2022 - 2027
- PhD Supervisor – Prof. Kerry McGawley
- Theme – Improve knowledge and communication about stigmatized health topics

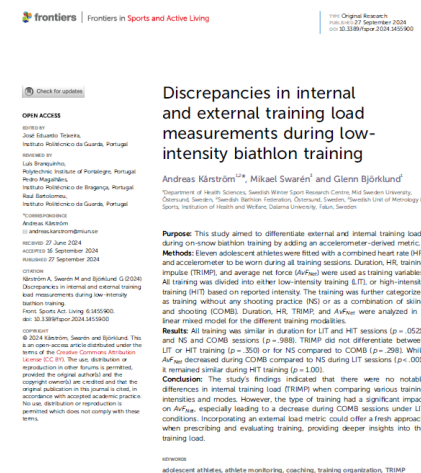
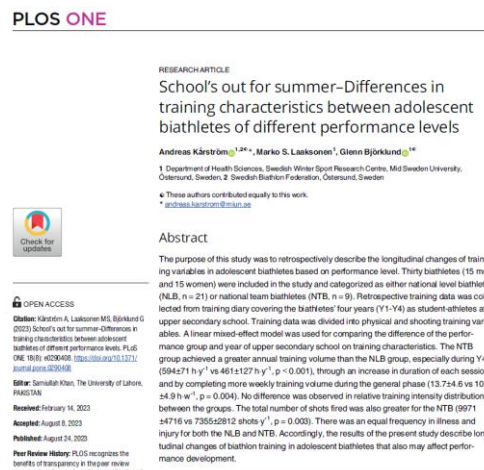


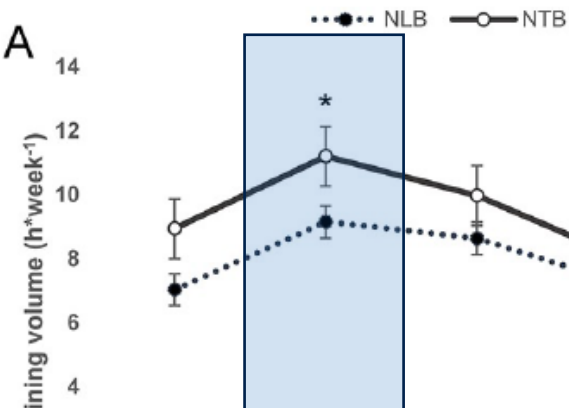




Collaboration with Swedish Biathlon

- Embedded Scientist – Professor Marko Laaksonen
- Embedded PhD Student – Andreas Kårström 2022 - 2026
- PhD Supervisor – Dr. Glenn Björklund
- Theme – From Junior to Senior

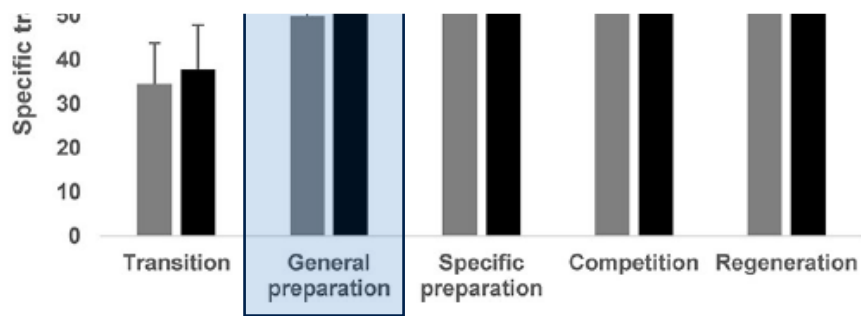




Summer Preparation: A Catalyst for Youth Biathlete Progress?

TABLE 1 Median duration spent in either intensity of zone 0, low-intensity training (LIT), and high-intensity training (HIT) with (COMB) and without (NS) shooting practice.

	LIT-NS	LIT-COMB	HIT-NS	HIT-COMB
Session duration (min)	108 [92–124]	93 [85–105]	92 [87–105]	100 [90–110]
Zone-0 duration (min)	4 [2–15]	6 [4–8]	5 [2–12]	9 [3–10]
LIT duration (min)	85 [58–103]	59 [48–72]	57 [53–60]	59 [49–65]
HIT duration (min)	4 [0–21]	25 [20–33]	29 [18–35]	36 [30–37]



Decision making: Data driven research in Biathlon

Laaksonen and Björklund
BMC Sports Science, Medicine and Rehabilitation (2025) 17:99
<https://doi.org/10.1186/s13102-025-01160-z>

BMC Sports Science, Medicine
and Rehabilitation

ORIGINAL RESEARCH
published: 29 March 2022
doi: 10.3389/sports.2022.1041619

RESEARCH

Open Access

Performance indicators in women's and men's biathlon relay

Marko S. Laaksonen^{1*} and Glenn Björklund¹

Abstract
This study aimed to investigate how different legs as well as cross-country skiing and shooting performances, associate to final rankings in biathlon relay competitions for both women and men. Data including rank, finish/leg time (LT), course (CT), range (RT) and penalty (PT) times, as well as number of shots (NS) and penalty loops (NPL), were collected from the International Biathlon Union's database over two seasons, comprising 12 competitions for all teams ranked 1–20. Teams were categorized as G3 (rank 1–3), G10 (rank 4–10) and G20 (rank 11–20). Kruskal-Wallis' test was used to compare the variables between the groups in total for an entire relay competition, and for each leg. For women, LT was longer for G20 across all four legs due to longer CT, and for G10 during legs 2 and 4 due to longer RT compared to G3 ($p < 0.05$). For men, LT was longer for G20 during all legs due to longer CT and RT (legs 2–4), and for G10 during legs 3 and 4 due to longer CT compared to G3 ($p < 0.05$). The present results suggest therefore that the shooting performance for women (especially shorter RT) during legs 2 and 4, and skiing performance for men during legs 3 and 4, are most decisive for final performance during a biathlon relay.

Keywords Competition, Cross-country skiing, Final rank, Rifle shooting, Tactics, Team performance

Women:
Shooting (fast,
accurate) in legs
2 & 4 is most
decisive for top
team results.

Men: Skiing
performance in
legs 3 & 4 is key
for team
ranking.

Small University, Big Impact: Benefits for All

Short Distances! Federation / Coach /
Researcher / Athlete / Test Leader / Head of
Research Centre

Students at BSc, MSc and PhD programs

International students

Guest researchers



Threats for a long-term collaboration in applied sports research

Protectionist
coaches

Poor knowledge
about each
others focus

Researchers
with grandiose
persona

Academic
competition



Final Words



Transparent dialogue – respect applied and scientific knowledge on equal terms



What federations can expect as well as can't expect



Science is a continuum – change is coming

Contact: glenn.bjorklund@miun.se