



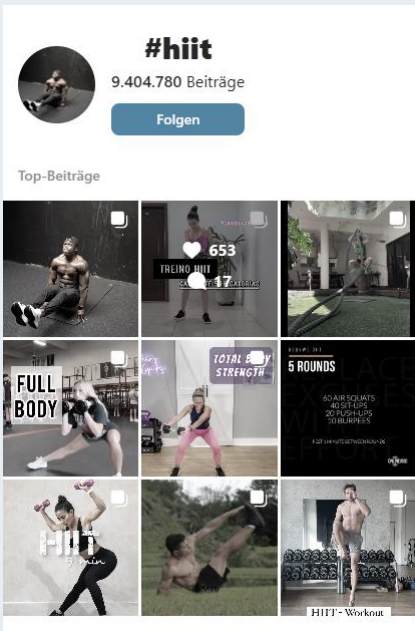


#globalcon23 | NSCA Global Conference 2023 | Munich 25/26.03.2023

## High-Intensity Interval Training: Current Insights

**Billy Sperlich**  
Integrative & Experimental Exercise Science & Training | University of Würzburg

   **PDF: Link in Bio**  /sportsandscience



#hiit  
9.404.780 Beiträge  
Folgen

Top-Beiträge

653 TREINO HIIT  
17 LIKES


653 TOTAL STRENGTH  
17 LIKES

5 ROUNDS  
40 AIR SQUATS  
20 PUSH-UPS  
20 BURPEES  
120 SECONDS

HITT - Workout

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## HIIT practice session



**Dr. Manuel Matzka**

NSCA GLOBAL CONFERENCE 2023					Saturday 25th March			
Language / Room	ENGLISH	Lecture Room	GERMAN	Plenum Room	International	Gym Hall	International	Small Gym
Zeit	SPEAKER	TOPIC	SPEAKER	TOPIC	SPEAKER	TOPIC	SPEAKER	TOPIC
8:00 - 9:00	REGISTRATION	COFFEE & Breakfast Buffet** *new design, 100 Euro	@Cafeteria Sportchule		Dr. Brent Allow, President NSCA Drug Metting, NSCA Daniela Ford, NSCA SC Ser NSCA Intern. Affairs	OPENING & WELCOME, Welcome Videos		
9:00 - 09:20					Prof. Dr. Stephan Gellera, President NSCA SC Germany	"Bridging the Gap" in Strength & Conditioning		
10:00 - 10:50	Brian Swolin sponsored by Keller	Horizontal Force Production	Prof. Dr. Thimo Wiewelweh	Regenerationsinterventionen und deren Wirksamkeit im Sport	Christian Boses, CSCS	PRACTICAL Train like an Olympian	Volker Lichte	LECTURE Hard Facts zu Soft Skills - Erfolgsfaktoren im Spitzensport
11:00 - 11:50	Jonas Weis	A tendon needs load! Tendon Rehab from Science to Practice	David Griger	Die Bedeutung von Bewegungsvermögen und Anpassungsfähigkeit im Sport - Argumente gegen übermäßige Spezialisierung	Brian Swolin sponsored by Keller	PRACTICAL Horizontal Force Production	Dr. Christian Richter	LECTURE Data analysis for Strength & Conditioning coaches - chances & obstacles
12:00 - 12:50	Antonio Espartero, CSCS sponsored by VLLS	High-Force Eccentric Training	Patrick Prolowski	Schmerzen reduzieren & Leistung steigern: Aktueller Forschungsstand und praktische Maßnahmen	Nadine Nursey	PRACTICAL Coaching vs. Teaching	Wolfgang Seivy	LECTURE Relax your System - nachhaltige Erfolge gemeinsam erzielen, Erfahrungen aus dem Leistungssport
13:00- 14:00	WELLNESS					WELLNESS TRY HIIT		Video presentations
14:00- 14:50	Dr. Brent Allow, PhD NSCA	Dose-Response of Resistance Training A Historical Perspective	Prof. Dr. Sebastian Seibert	Molekulare Krafttrainingsphysiologie "Übersetzungsspektre vom Labor ins Fitnessstudio"	Antonio Espartero sponsored by VLLS	PRACTICAL Neuromuscular Profiling on Force Plates	NSCA POLAND NSCA SHANGHAI	
15:00- 15:50	Prof. Dr. Billy Sperlich	Akutele Erkenntnisse zu Trainingsformen in High-Intensity Training	Dr. (Cand) Alexander Pirnat, CSCS	Die biomechanische Betrachtung von Kompositionenstrategien bei Anlauf- und konkurrenzorientierten Ausdauerläufen & geringen Längen	Eberhard Schlimmer sponsored by Perform Better Europe	PRACTICAL Strategies to improve and/or modify & stability	NSCA JAPAN NSCA KOREA	Video presentation
16:00-16:50	Prof. Dr. phil. habil. Thomas Brunsell	Identifying muscle injury patterns in professional soccer: potential for injury reduction by specific multi-component strength and conditioning programs.	Prof. Dr. Dr. rer. nat. Bettger	Belastungsinduzierte Muskelschäden	Dr. Simon Savaris, CSCS	PRACTICAL Bioflex Restriction Training	NSCA ITALY NSCA SPAIN	Video presentation
17:00- 17:50	Rob Ahman, NSCA	International touring with team sports: The role of SSC in match, recovery and readiness	Dr. Oliver Jan Quittmann	Maximale Leistungsleistungsfähigkeit bei deutschesprachigen für die Verbesserung von Belastungslasten im Ausdauersport?	Manuel Matzka	PRACTICAL High Intensity Training in Practice		
18:00 - 20:00		DINNER AVAILABLE / BUFFET *new location	@Cafeteria Sportchule @Sportbar Sportchule					
21:00 - 24:00		SOCIAL: MEET THE BAR *new location						

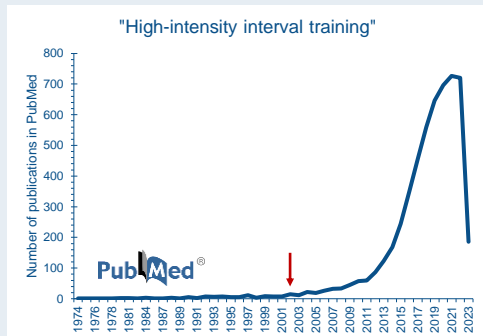
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## Frequent questions from coaches & athletes



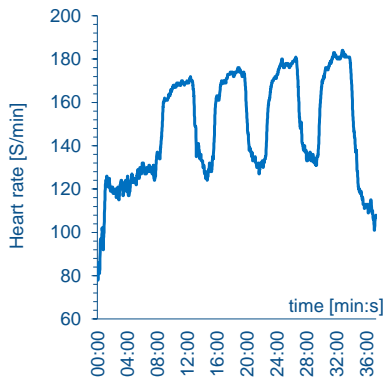
Youth, beginner, well-trained, world class  
Running, cycling, triathlon, swimming, soccer

1. What type of HIIT is best for my sport?
2. How does HIIT compare to other forms of training for athletic performance?
3. How does HIIT fit into a mid-long term perspective?
4. What are the potential risks?

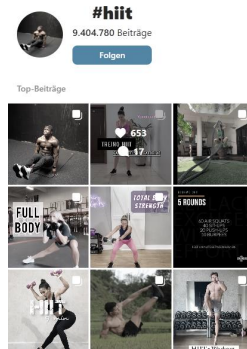
What type of HIIT is best for my sport?

„H“ in HIIT: HIIT ≠ HIIT ≠ HIT

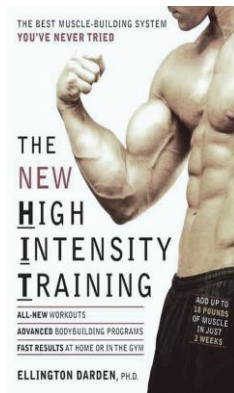
“Traditionally”



Often: “Crazy”/undefined mix: Strength/Endurance/Repeated Sprint Circuit...



Remember!  
HIIT ≠ HIT



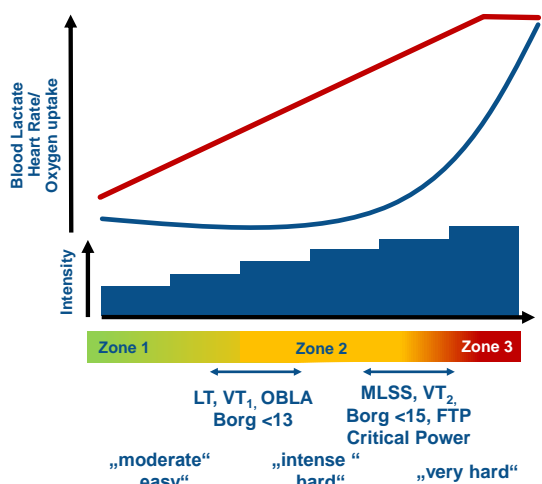
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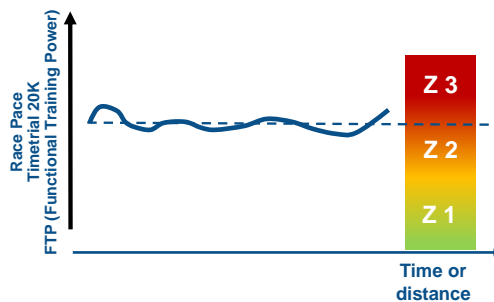
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Simple „intensity“ models



„Race-pace“ zones

e.g.: 10 km, 20 km time trial, FTP

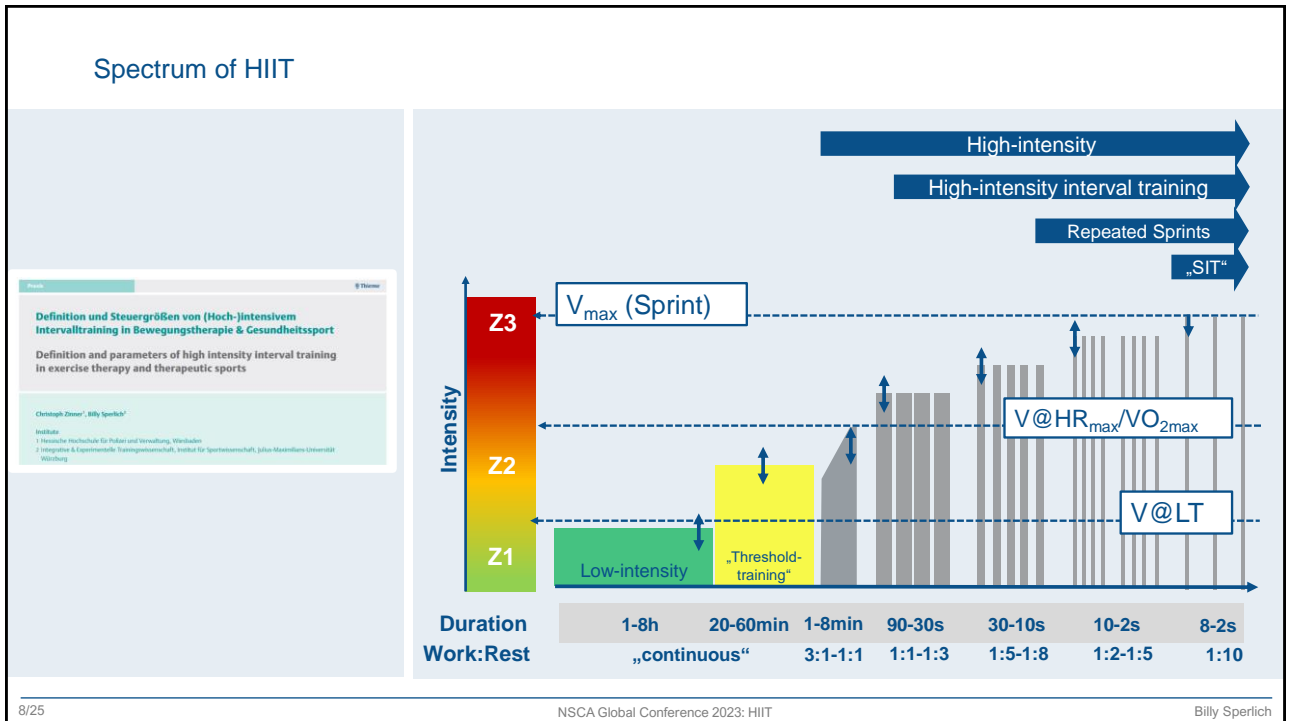


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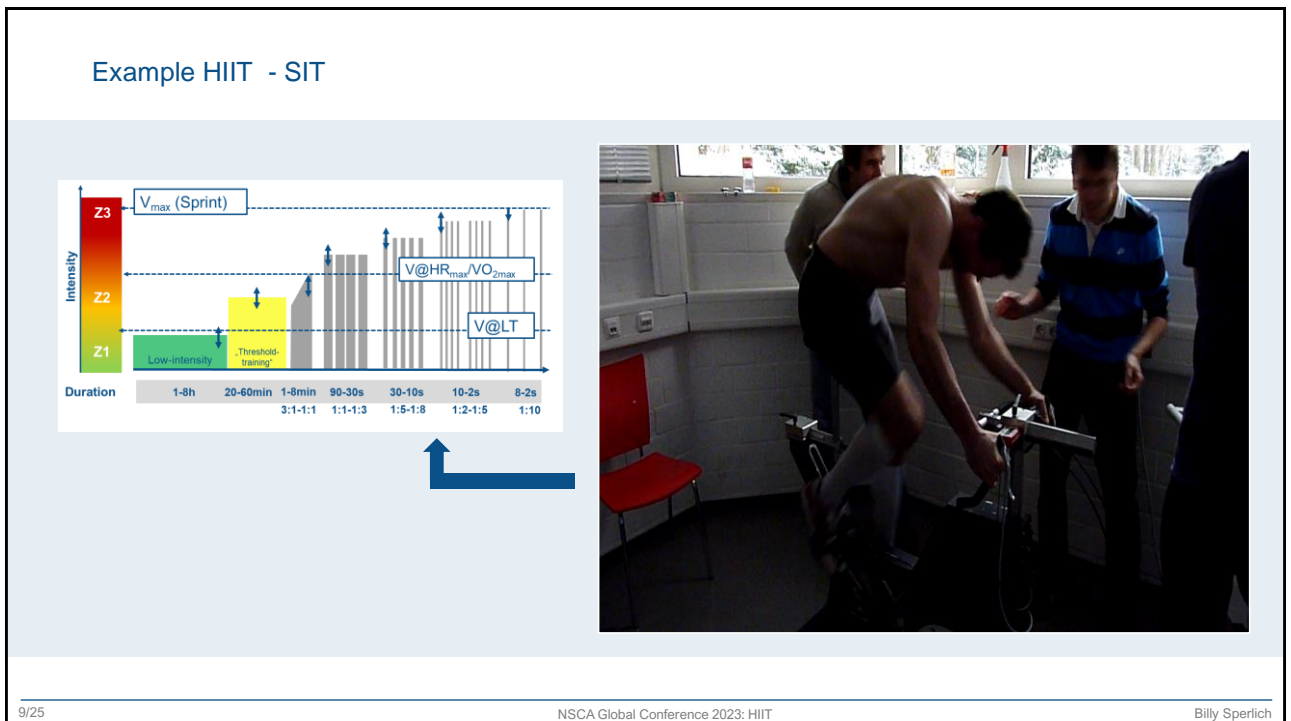
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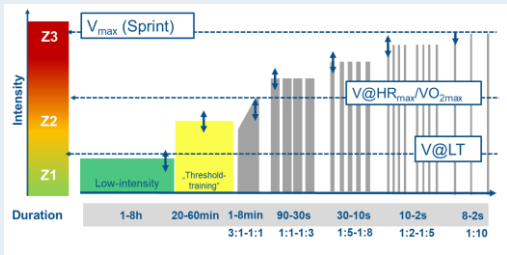


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### Example HIIT - Repeated Sprint/Small-Sided Games



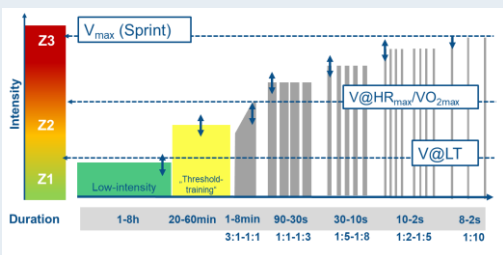
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### Examples HIIT



Journal of Sports Med Phys Fitness. 2017 Jul-Aug;57(7-8):969-975. doi: 10.23736/0002-4102-16-00539-7. Epub 2016 Jul 7.  
**Effects of combined high intensity arm and leg training on performance and cardio-respiratory measures**  
 Christoph Zinner<sup>1</sup>, Billy Sperlich<sup>2</sup>, Dennis Peter Born<sup>3</sup>, Guido Michalek<sup>3</sup>

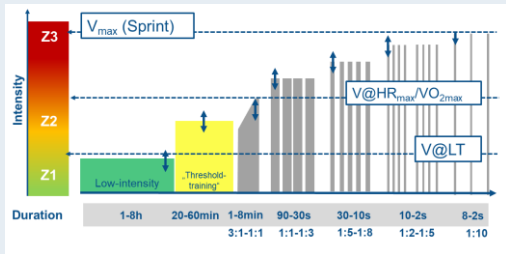
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Microbout-HIIT as activity breaks/"snacks"



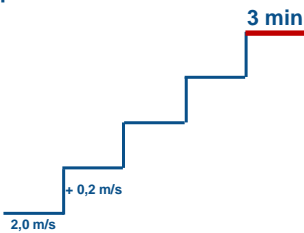
Prolonged Sitting Interrupted by 6-Min of High-Intensity Exercise: Circulatory, Metabolic, Hormonal, Thermal, Cognitive, and Perceptual Responses

Willy Sperlich <sup>1</sup>, Sascha De Groot <sup>2</sup>, Christoph Zinner <sup>3</sup>, Hans-Christoph Holmberg <sup>4,5</sup>, Björn Wolfrum-Sperlich <sup>6</sup>

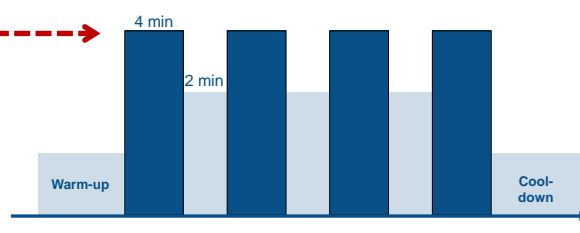
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Often applied: 4 x 4-min HIIT

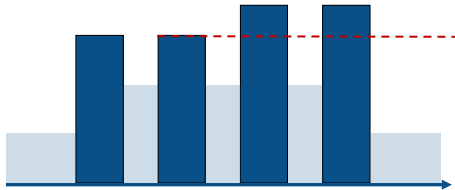
Step test



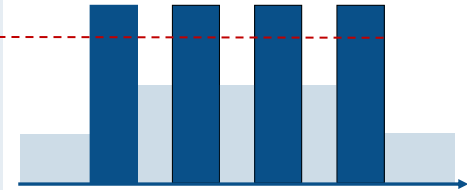
1<sup>st</sup> HIIT session



2<sup>nd</sup> HIIT session



3<sup>rd</sup> HIIT session



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## How does HIIT compare to other forms of training for athletic performance?

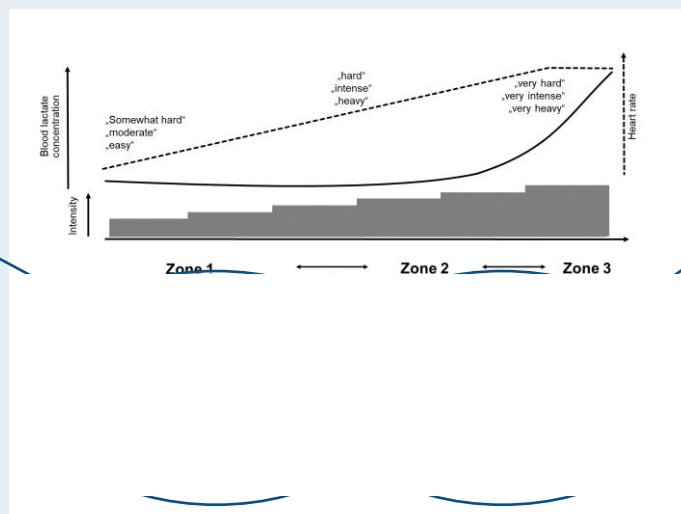
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### Possible differences between Z1, Z2, Z3



Neuro-muscular & metabolic Efficiency

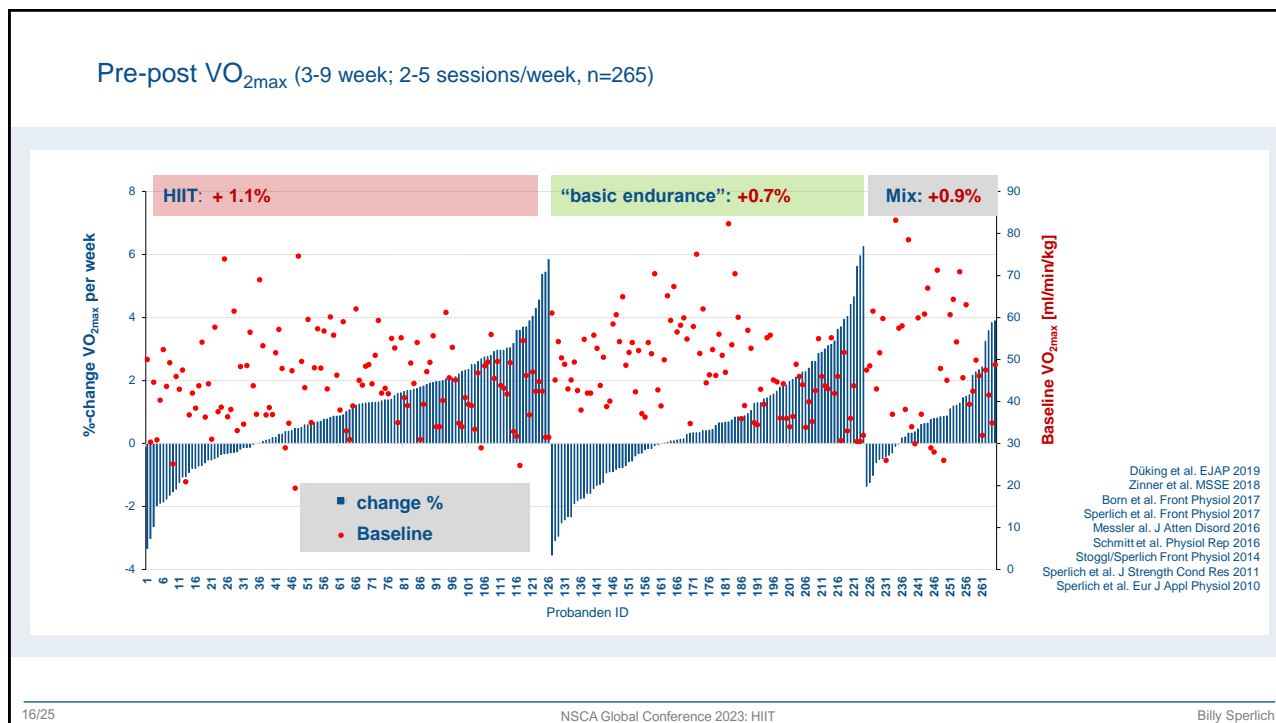
- Maximizing Oxidation
- H<sup>+</sup>-Buffering
- Pacing

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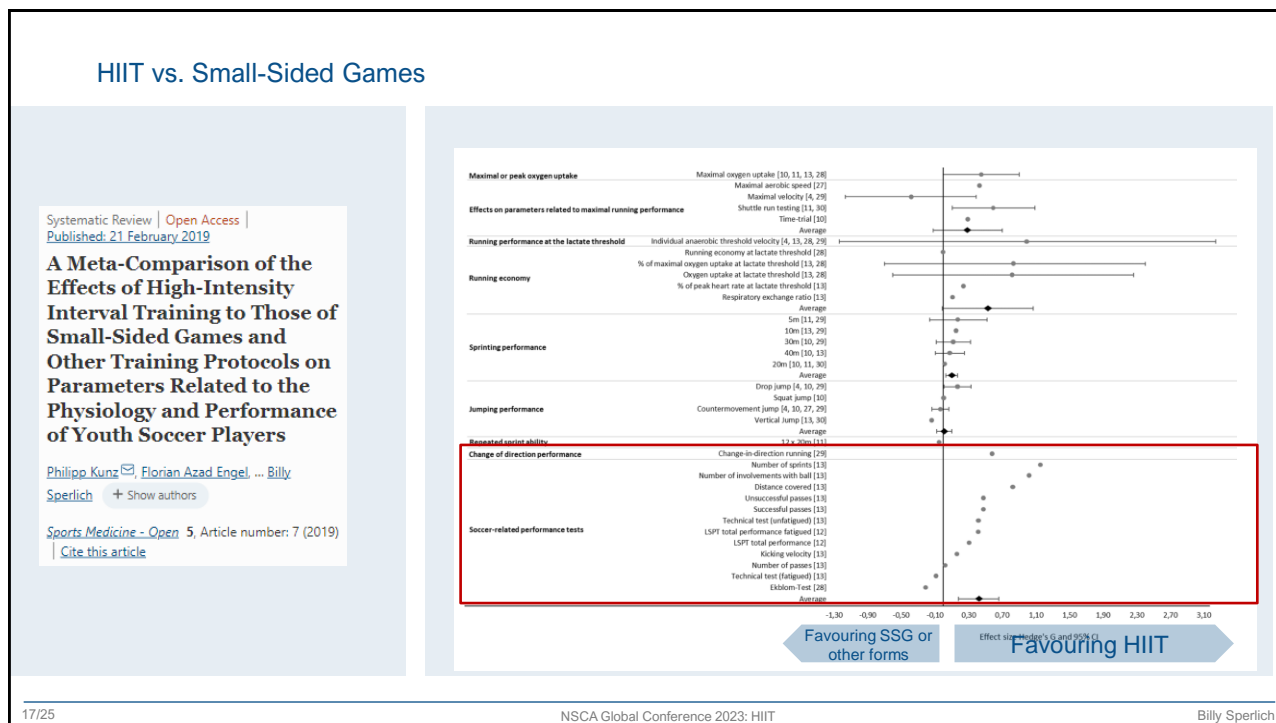
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## How does HIIT fit into a mid- & long-term perspective?

Three examples: Beginner, Well Trained, World Class

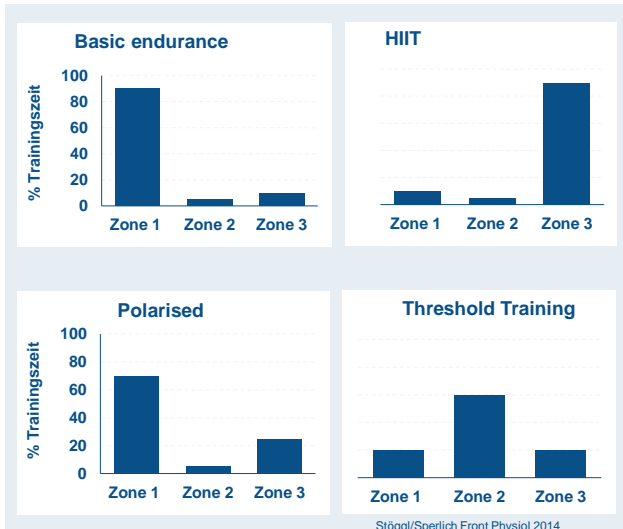
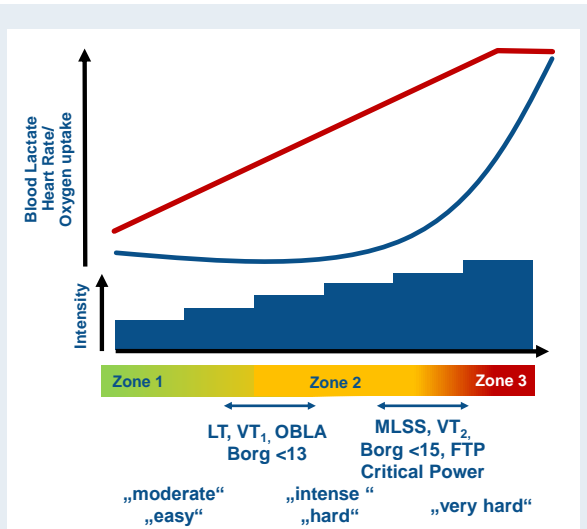
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### Distributing intensity over time

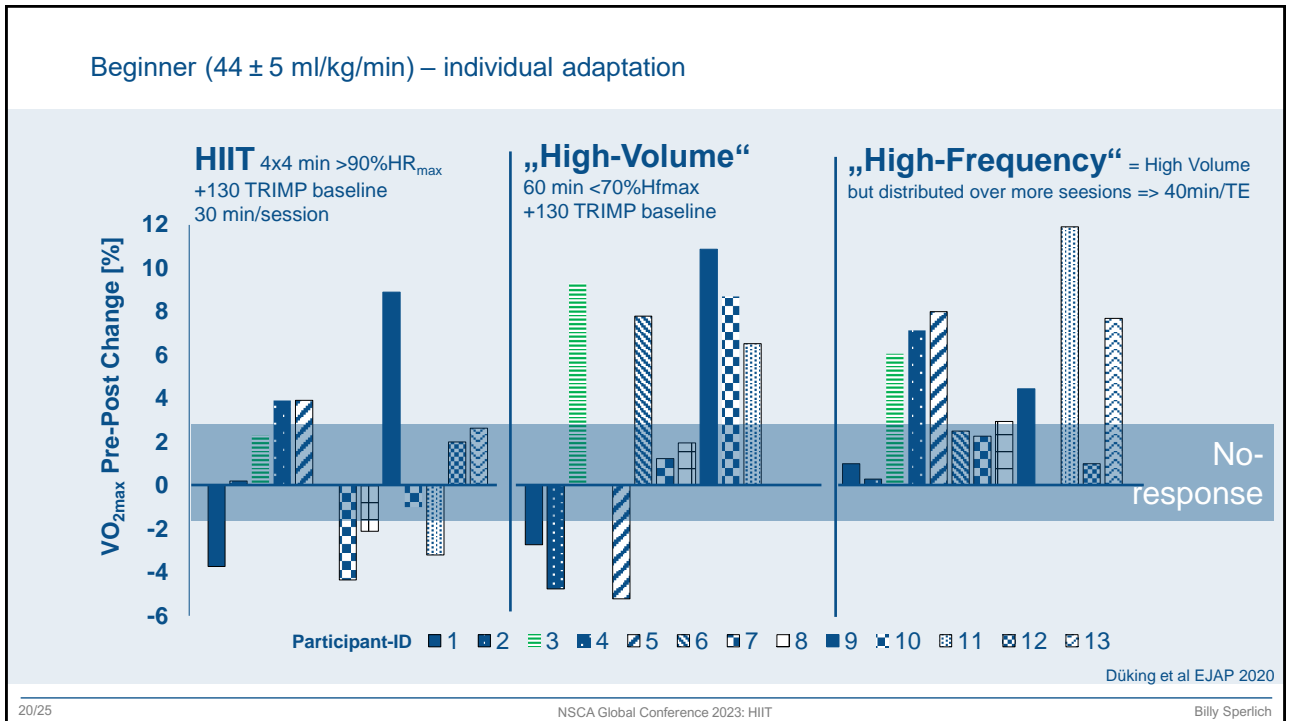


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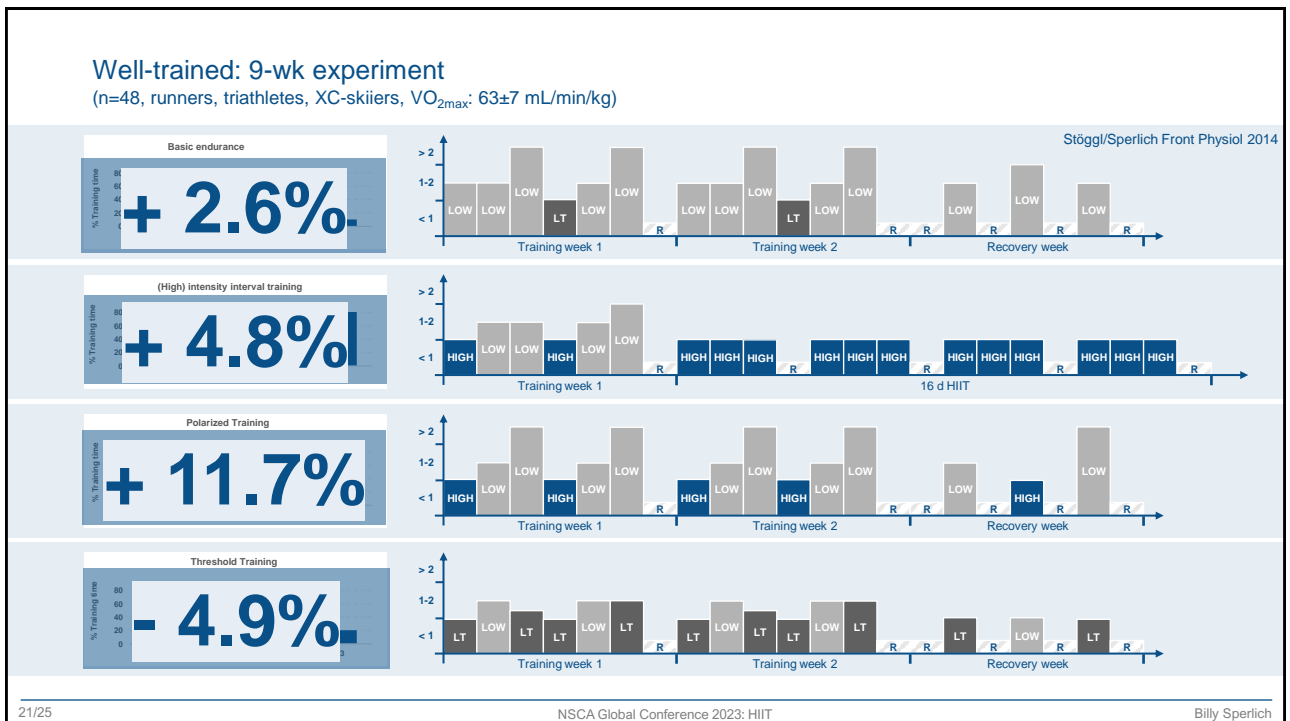


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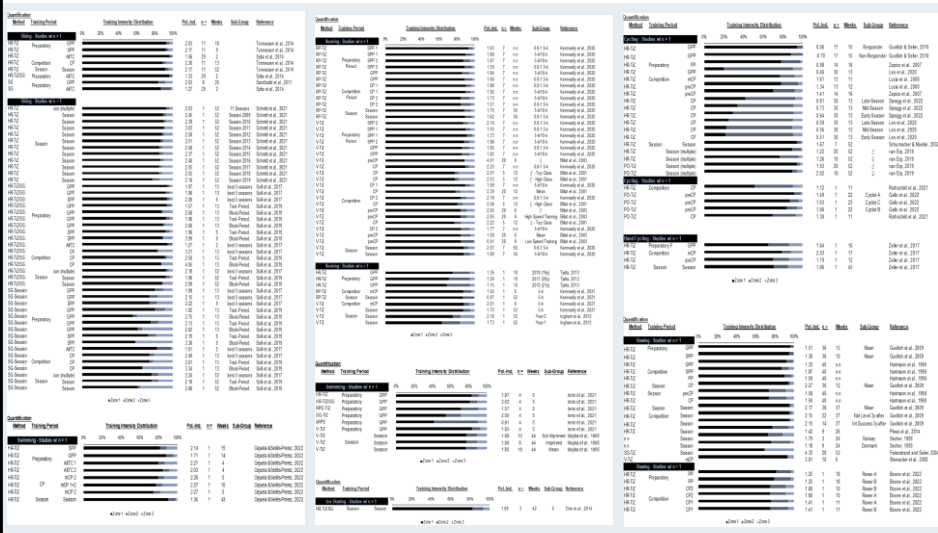
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Preview: Training intensity distribution in elite endurance sports



- Z1, Z2 and Z3 vary considerably but 93% of all TIDs reported Z1 proportions ≥ 60%
- 69 (42%) of 162 TIDs are based on single-case reports of which 44 TIDs originate from cross-country skiing.

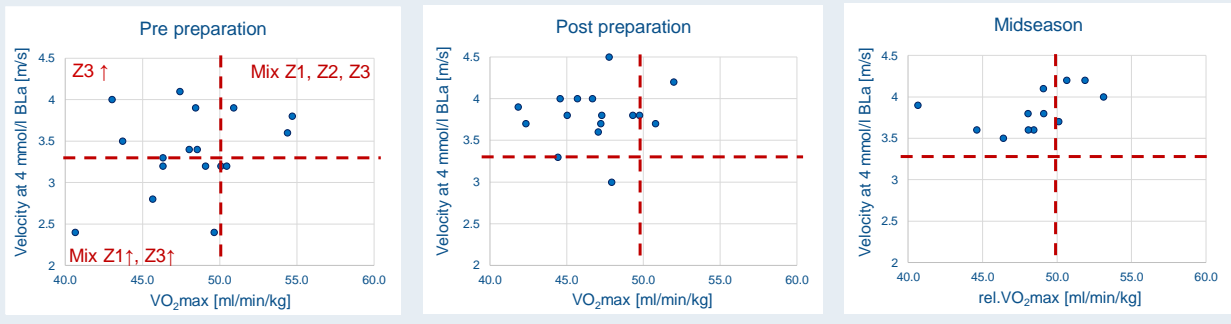
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Emphasizing Zones: One possible solution in team sports..



Thanks to Christoph Zinner for sharing data!

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## What are the potential risks and benefits?

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### Time-effect ratio with HIIT



HIIT effort and training effect appear to be in a favorable ratio.

Effort-effect calculations & motivation:  
The less effort perceived and estimated in relation to the effect of exercise, the more motivated the individuals are/become.

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## HIIT may be inappropriate

frontiers  
in Psychology | Psychology for Clinical Settings

OPEN ACCESS  
published: 22 December 2024  
doi: 10.3389/fpsyg.2024.1444444

### Why sprint interval training is inappropriate for a largely sedentary population

Barth J. Herberich<sup>1</sup>, Hannah Kay<sup>2</sup>, Louisa Bauer<sup>1</sup> and Martin K. Häggel<sup>1</sup>

[...] **“inappropriate for sedentary individuals because engaging in such training requires high levels of motivation and confidence. Sprint interval programmes of exercise are also relatively complex and involve a high degree of self-regulation, which may also be a barrier to continuation in those who are uninitiated.**

BJSM

### High-intensity interval training in patients with lifestyle-induced cardiometabolic disease: a systematic review and meta-analysis

Kassia S Weston, Ulrik Wisloff and Jeff S Coombes  
Br J Sports Med 2014 48: 1227-1234

#### Box 2 Suggested contraindications to high-intensity interval training (HIIT)

- ▶ Unstable angina pectoris
- ▶ Uncompensated heart failure
- ▶ Recent myocardial infarction (<4 weeks)
- ▶ Recent coronary artery bypass graft or percutaneous coronary intervention (<12 months)
- ▶ Heart disease that limits exercise (valvular, congenital, ischaemic and hypertrophic cardiomyopathy)
- ▶ Complex ventricular arrhythmias or heart block
- ▶ Severe chronic obstructive pulmonary, cerebrovascular disease or uncontrolled peripheral vascular disease
- ▶ Uncontrolled diabetes mellitus
- ▶ Hypertensive patients with blood pressure >180/110 (or uncontrolled)
- ▶ Severe neuropathy

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## Functional circuit HIIT in overweight females

ORIGINAL RESEARCH ARTICLE  
Front. Physiol. | doi: 10.3389/fphys.2017.00172

### Functional high-intensity circuit training improves body composition, peak oxygen uptake, strength and alters certain dimensions of quality of life in overweight women

Billy Sperlich<sup>1</sup>, Birgit Wallmann-Sperlich<sup>1</sup>, Christoph Zinner<sup>1</sup>, Valerie von Staufenberg<sup>1</sup>, Helena Løstert<sup>1</sup> and Hans-Christer Holmberg<sup>2</sup>

<sup>1</sup>University of Würzburg, Department of Sports Science, Germany  
<sup>2</sup>Swedish Winter Sports Research Centre, Department of Health Sciences, Mid Sweden University, Östersund, Sweden, Sweden

9 week functional strength & endurance training  
(n=19 female; BMI: 28 ± 3 kg/m<sup>2</sup>)

- Oxygen Uptake ↑
- Functional Strength ↑
- Body mass ↓
- Body Fat percentage ↓
- Aspects of Quality of Life ↑
- Pain ↑



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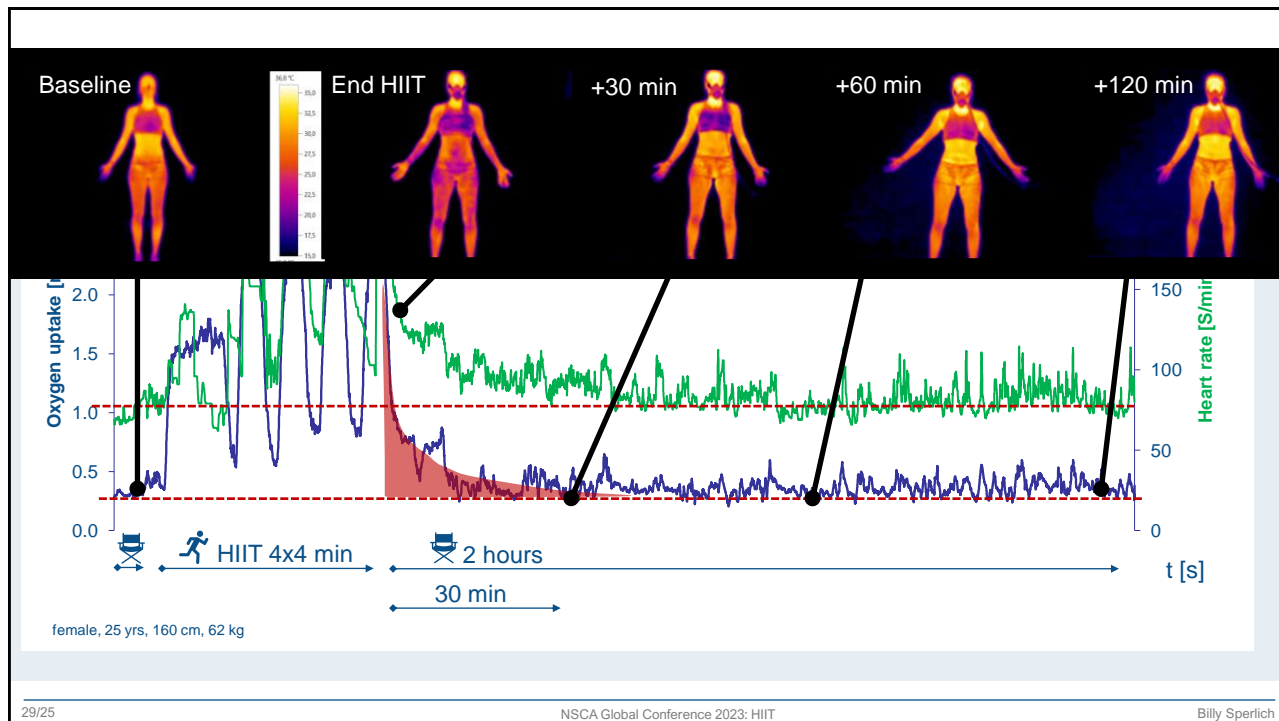
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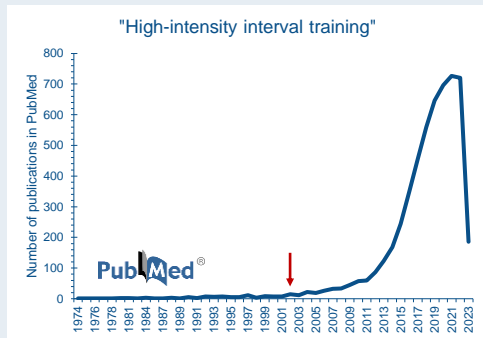
### Side effects – my experience



- Dizziness (often)
- Discomfort/unease (often)
- Vomiting (often)
- Post-exercise sweating
- Difficulty falling & staying asleep



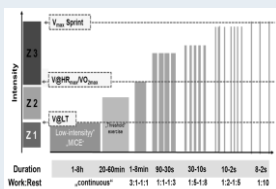
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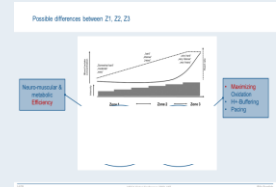
### Summary



**HIIT ≠ HIIT ≠ HIT**  
Variation of intensity, volume, frequency allows many protocols depending on the sports



HIIT very popular - but  
**a) effective / necessary?**  
**b) liked?**  
**c) tolerated?**



„Mechanism-Overlay“



• Many roads lead to Rome...

Thank you & spread the news!

[billy.sperlich@uni-wuerzburg.de](mailto:billy.sperlich@uni-wuerzburg.de)

[/billysperlich](https://twitter.com/billysperlich)



- ✓ 2 years
- ✓ Tuition-free
- ✓ English-spoken

Link in Bio: [/sportsandscience](https://www.instagram.com/sportsandscience)