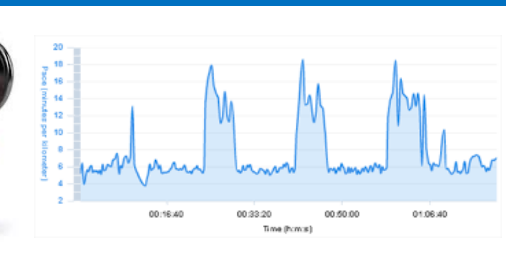


Einführung ins Thema

Prof. Dr. Lars Donath

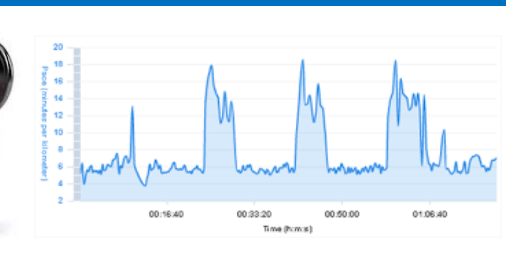
Trainingswissenschaftliche Interventionsforschung, Deutsche Sporthochschule



Die Rolle des körperlichen Training bei mentalen Störungen

Prof. Dr. Lars Donath

Trainingswissenschaftliche Interventionsforschung, Deutsche Sporthochschule



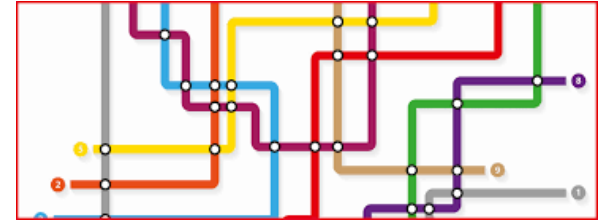
Trainings(steuerung) bei Depression

Prof. Dr. Lars Donath

Trainingswissenschaftliche Interventionsforschung, Deutsche Sporthochschule

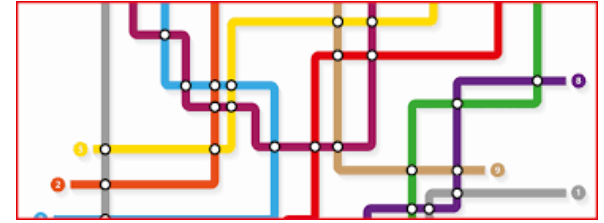


Fahrplan



- ✓ ...Krankenlast und Pathophysiologie
 - ✓ ...Fitness: Atemineffizienz und kardiales Risiko
 - ✓ ...RCTs & Intensitätsfestlegung
 - ✓ ...Trainingsbarrieren und Präferenzen
 - ✓ ...Exkurs: Sprint Interval Training bei Depression
-

Fahrplan



- ✓ ...Krankenlast und Pathophysiologie
 - ✓ ...Fitness: Atemineffizienz und kardiales Risiko
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 - ✓ ...Trainingsbarrieren und Präferenzen
 - ✓ ...Exkurs: Sprint Interval Training bei Depression
-

Blick in den Rückspiegel

1996

WHO has ranked depression the 4th leading cause of disability worldwide and projects that by 2020, it will be the 2nd leading cause.

Murray & Lopez (1996) Evidence-based health policy--lessons from the Global Burden of Disease Study. Science.

2006

% of DALYs		
1	Unipolar depressive disorders	9.8
2	Ischaemic heart disease	5.9
3	Alzheimer and other dementias	5.8
4	Alcohol use disorders	4.7
5	Diabetes mellitus	4.5
6	Cerebrovascular disease	4.5
7	Hearing loss, adult onset	4.1
8	Trachea, bronchus, lung cancers	3.0
9	Osteoarthritis	2.9
10	COPD	2.5

Mathers & Loncar (2006) Projections of global mortality and burden of disease from 2002 to 2030. PLoS Medicine

This Issue

Views **16,646** | Citations **0** | Altmetric **572**

Global Health

April 18, 2017

Depression Is the Leading Cause of Disability Around the World

M.J. Friedrich

JAMA. 2017;317(15):1517. doi:10.1001/jama.2017.3826

The proportion of the global population living with depression is estimated to be **322 million people—4.4%** of the world's population—according to a new **report**, "Depression and Other Common Mental Disorders: Global Health Estimates," released by the World Health Organization. The report also includes data on anxiety disorders, which affect more than 260 million people—3.6% of the global population. The prevalence of these common mental **disorders is increasing, particularly in low- and middle-income countries**, with many people experiencing both depression and anxiety disorders simultaneously.

Blick durch die Schweizer Brille



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

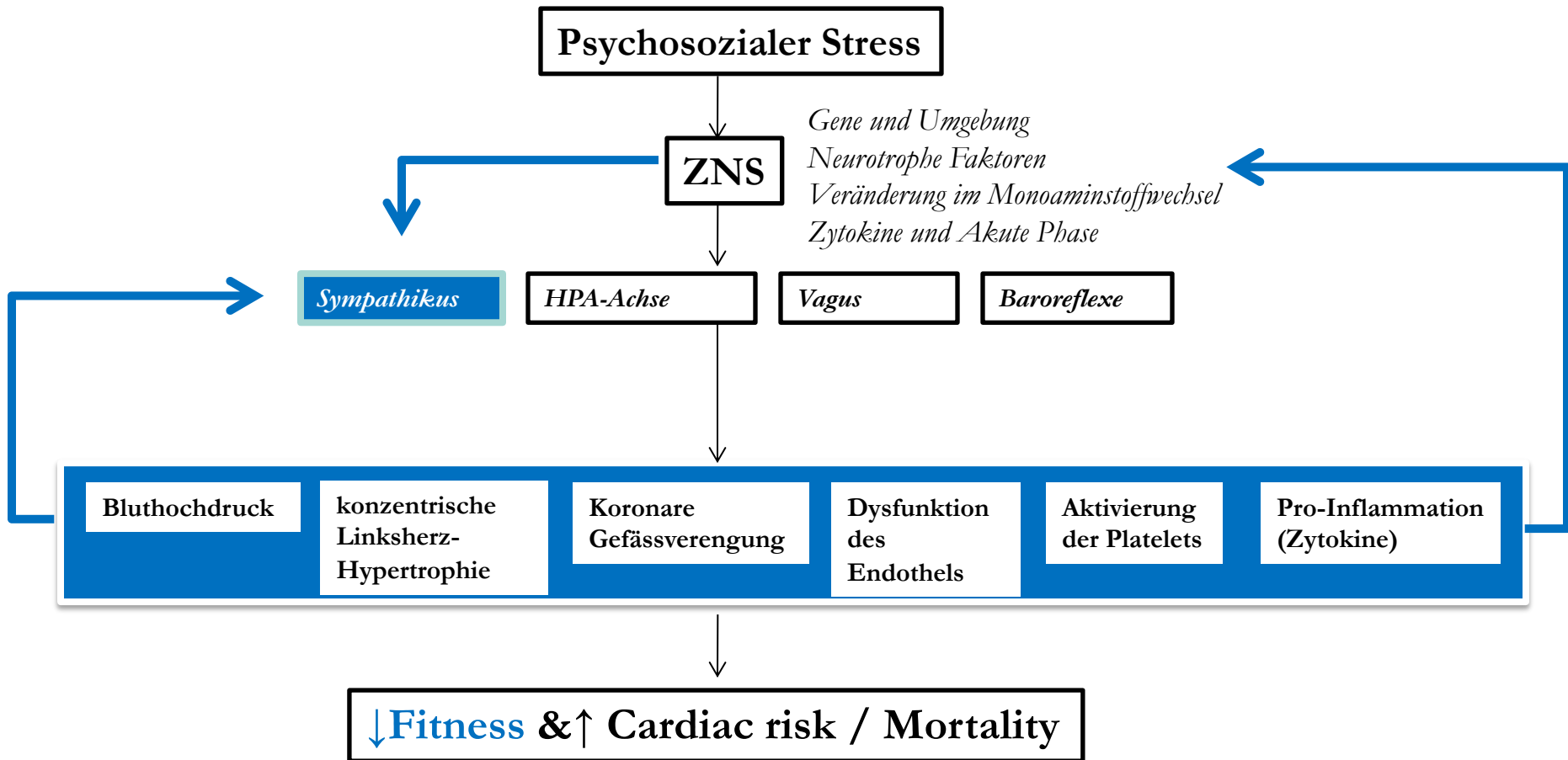
Bundesamt für Statistik

Psychische Gesundheit

	Männer	Frauen
(Hohe) Vitalität und Energie, in % ¹ (2017)	53,7	43,7
(Geringe) soziale Unterstützung, in % ¹ (2017)	9,8	10,1
Mittlere oder hohe psychische Belastung, in % ¹ (2017)	11,7	18,3
Major Depression, in % ¹ (2017)	7,8	9,5
Behandlung infolge psychischer Probleme, in % ¹ (2017)	4,4	7,7
Suizide (ohne assistierten Suizid) (2021)	719	286

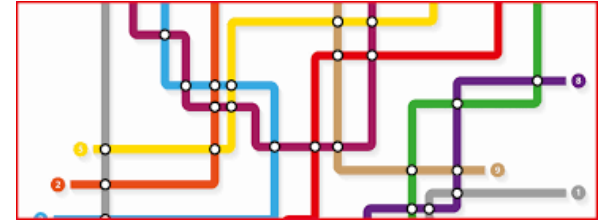
1 Bevölkerung ab 15 Jahren in Privathaushalten

Auswahl: Pathophysiologische Mechanismen



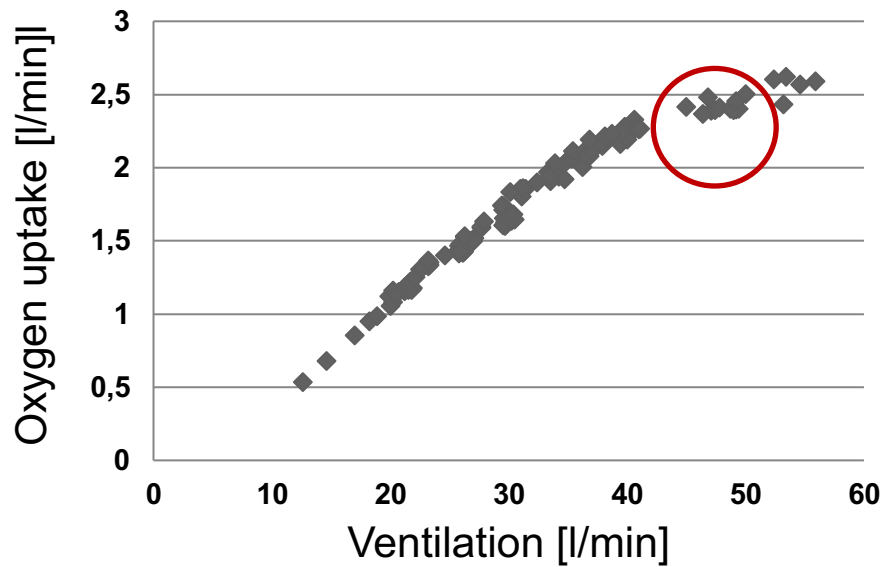
Musselman et al. (1998) The relationship of depression to cardiovascular disease: epidemiology, biology, and treatment. Arch Gen Psychiatry
Stein et al. (2006) Does co-morbid depressive illness magnify the impact of chronic physical illness? A population-based perspective. Psychol Med
Carney et al. (2002) Depression as a risk factor for cardiac mortality and morbidity: a review of potential mechanisms. J Psychosom Res

Fahrplan

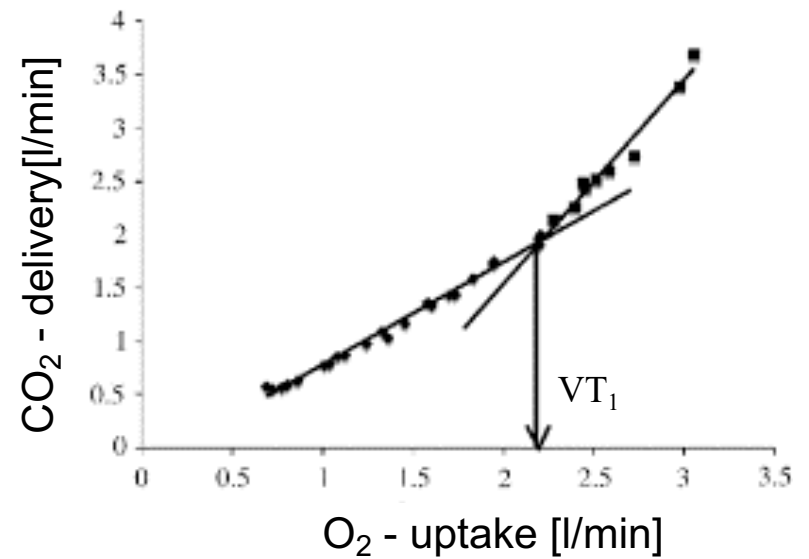


- ✓ ...Krankenlast und Pathophysiologie
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-

Fitness & Ventilation

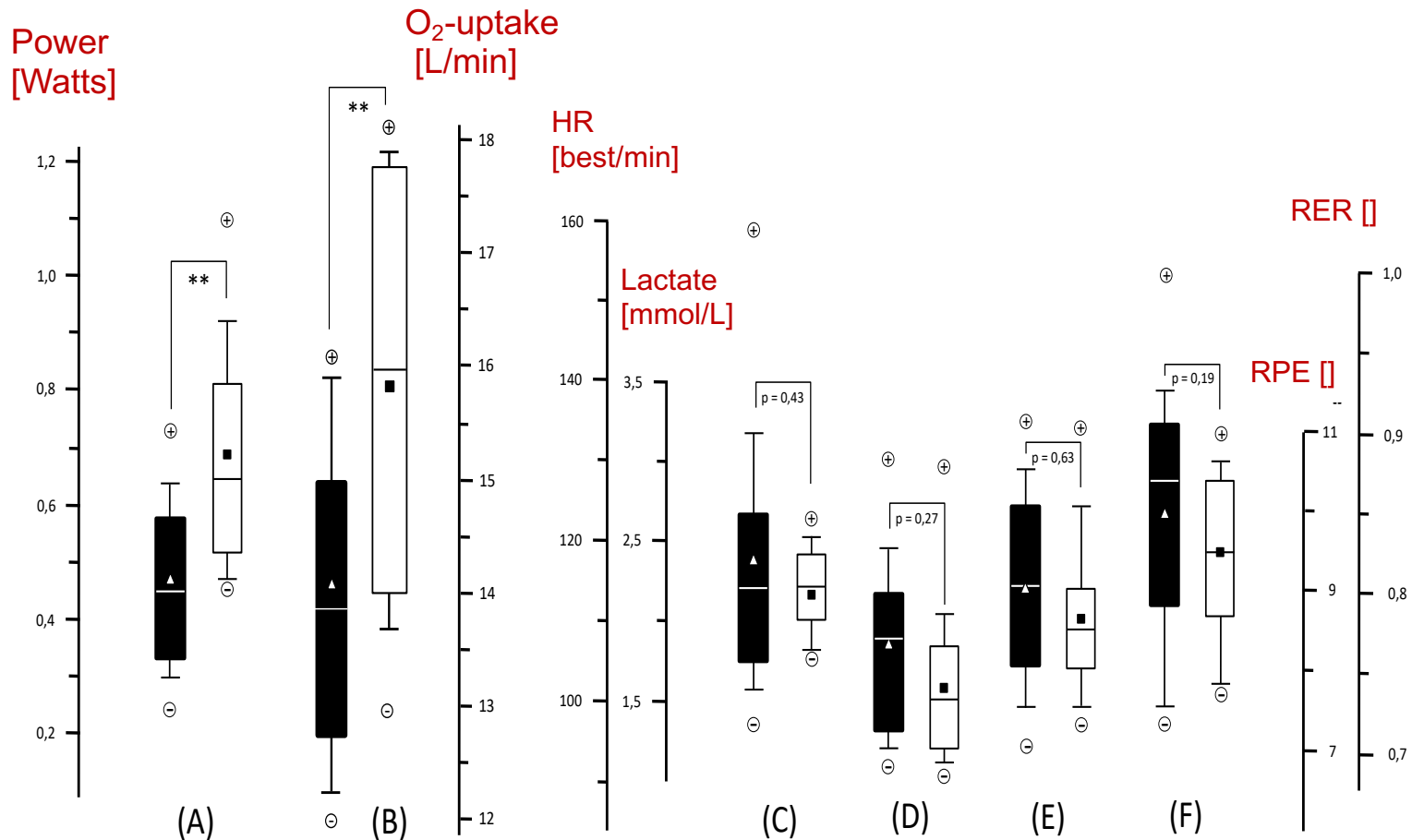


Hollmann (1959)



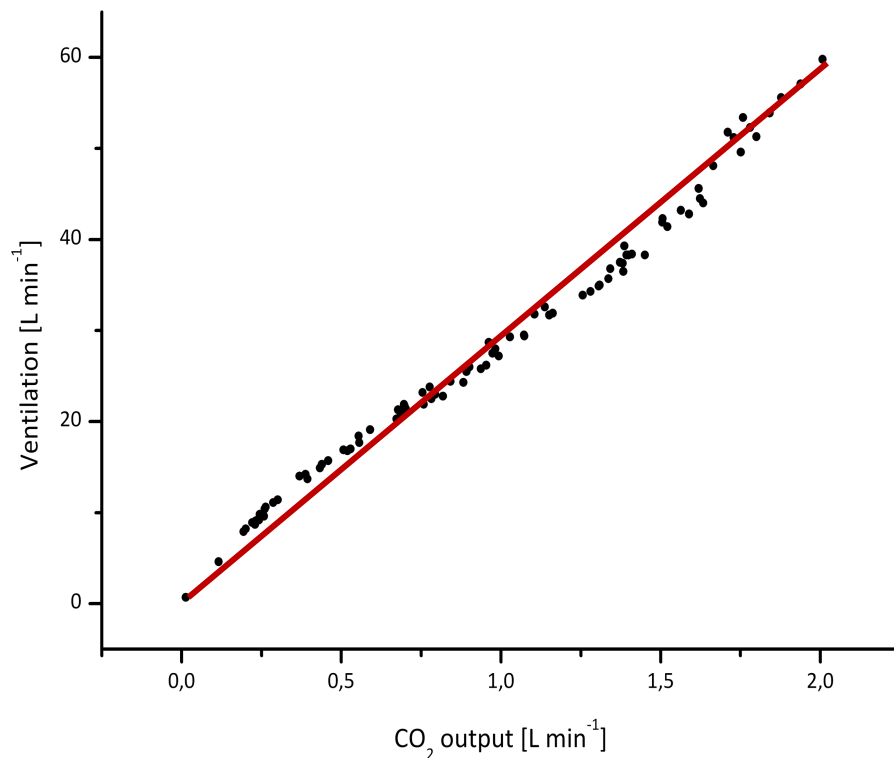
Beaver (1986)

Fitness & Beanspruchung



Donath et al. (2010) Ventilatory inefficiency in major depressive disorder: a potential adjunct for cardiac risk stratification in depressive disorders. Prog Neuropsychopharmacol Biol Psychiatry.

Ventilatorische Ineffizienz – Herzinsuffizienz



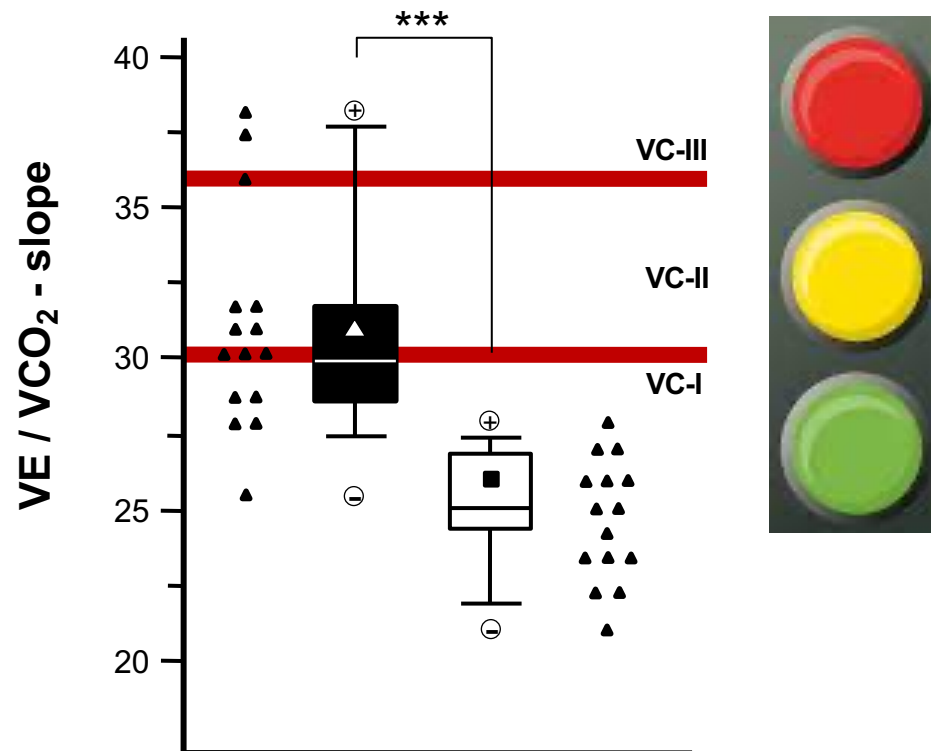
$$VE/VCO_2\text{-slope} = Pa_{CO_2} \times (1 - V_D/V_T)$$

Variable	χ^2	<i>P</i>
VE/Vco ₂ slope	72.6	<0.001
NYHA class	17.8 (Residual χ^2)	<0.001
LVEF	6.8 (Residual χ^2)	0.009
Cause of HF	1.2 (Residual χ^2)	0.27
Peak $\dot{V}O_2$	0.32 (Residual χ^2)	0.57
Age	0.003 (Residual χ^2)	0.96

Arena et al. (2007) Development of a ventilatory classification system in patients with heart failure. Circulation.
 Bard (2005) Cardiopulmonary exercise testing in patients with heart failure. J Am Coll Cardiol

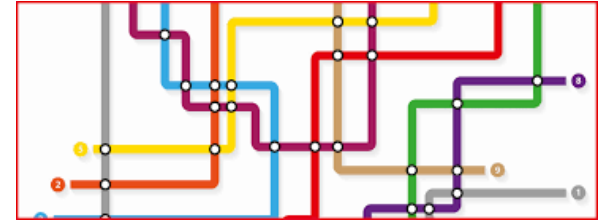
Ventilatorische Ineffizienz – Depression

	Age [years]	BDI	HAMD-21	BMI [kg·m ⁻²]	WH-ratio	IPAQ-total [MET Min·Week ⁻¹]	IPAQ-sitting [h·Week ⁻¹]
MDD	38 ± 12	27 ± 11	24 ± 5	25,4 ± 5	0,8 ± 0,08	1924 ± 1204	35,3 ± 14,2
Controls	38 ± 12	2,5 ± 2,2	1,6 ± 0,8	24,1 ± 5,1	0,8 ± 0,05	2067 ± 1225	38,2 ± 11,3



Donath et al. (2010) Ventilatory inefficiency in major depressive disorder: a potential adjunct for cardiac risk stratification in depressive disorders. Prog Neuropsychopharmacol Biol Psychiatry.

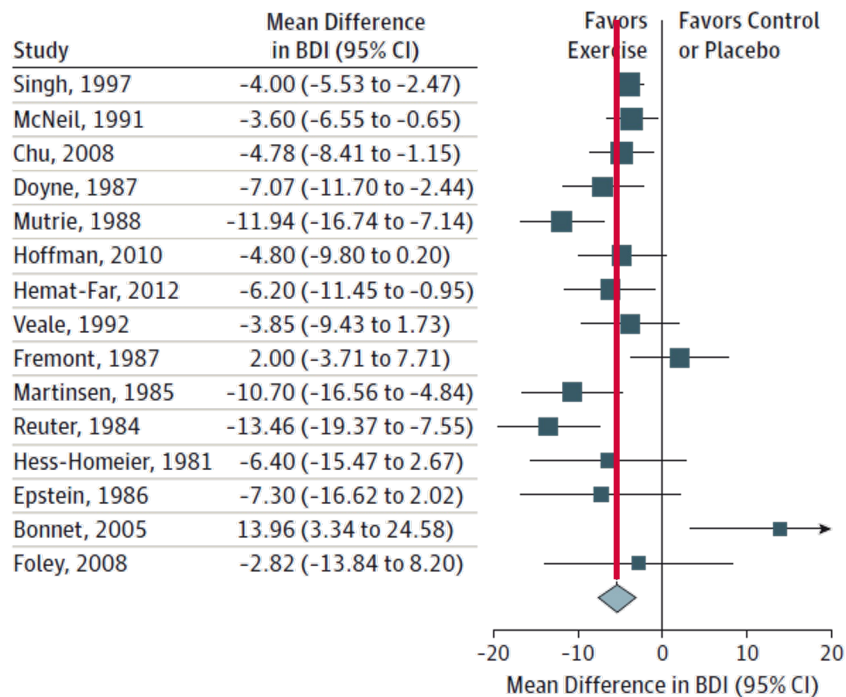
Fahrplan



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-

Meta-analyse: BDI Veränderungen

Figure. Mean Difference in Beck Depression Inventory Score for Exercise vs Control or Placebo Intervention

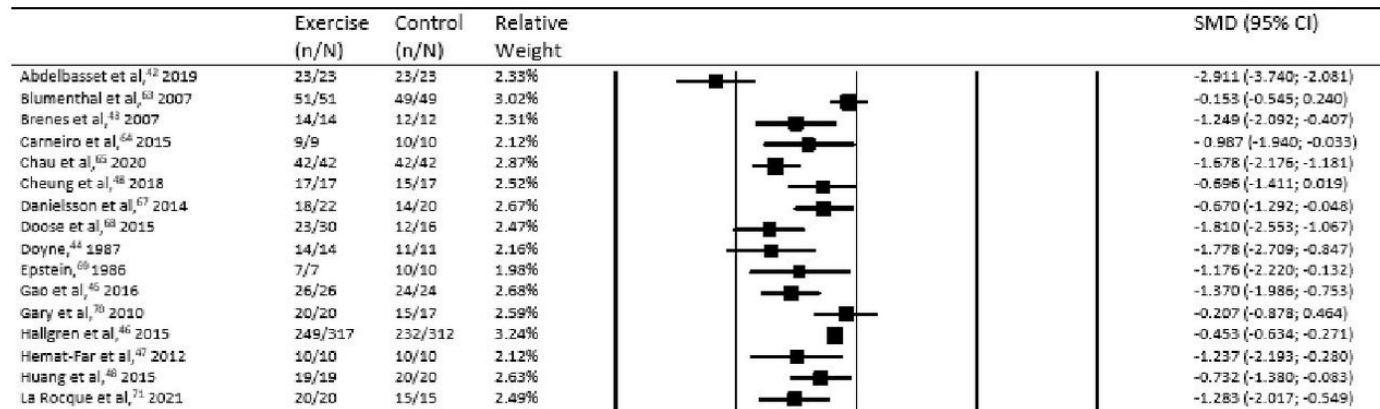


Mean differences in BDI: -5.3
(CI: -7.5; -3.2)

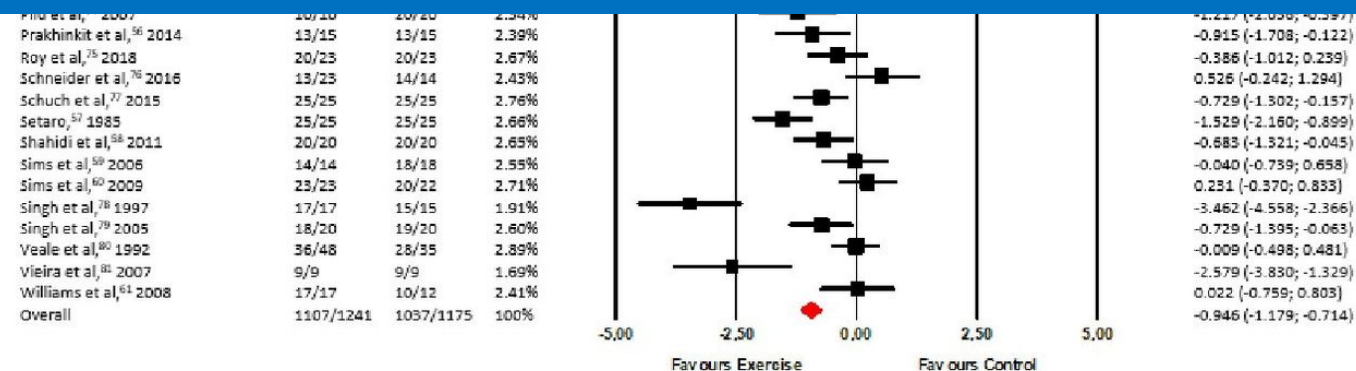
- 1979-2012
- ~2300 Patients (70% Frauen)
- 22 – 88 Jahre
- 4-16 Wochen
- Beck Depression Inventory (BDI)

Raw Scores	Depression Severity
0-13	Indicates minimal depression
14-19	Indicates mild depression
20-28	Indicates moderate depression
29-63	Indicates severe depression

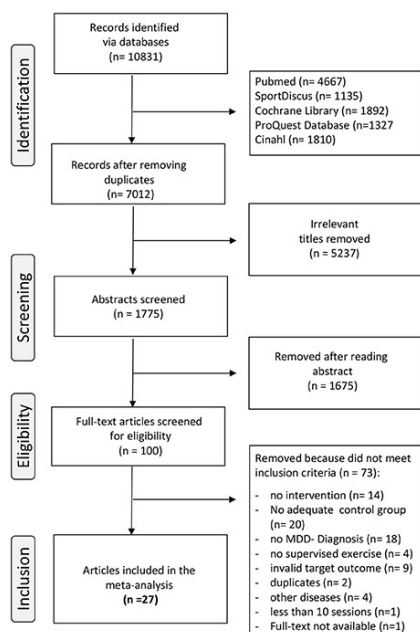
41 Studien / 2300 Teilnehmer – moderate Effekte



**Schwergrad und ↑Supervision
Grosse Effekte**



Andreas Heissel et al. Br J Sports Med 2023;57:1049-1057



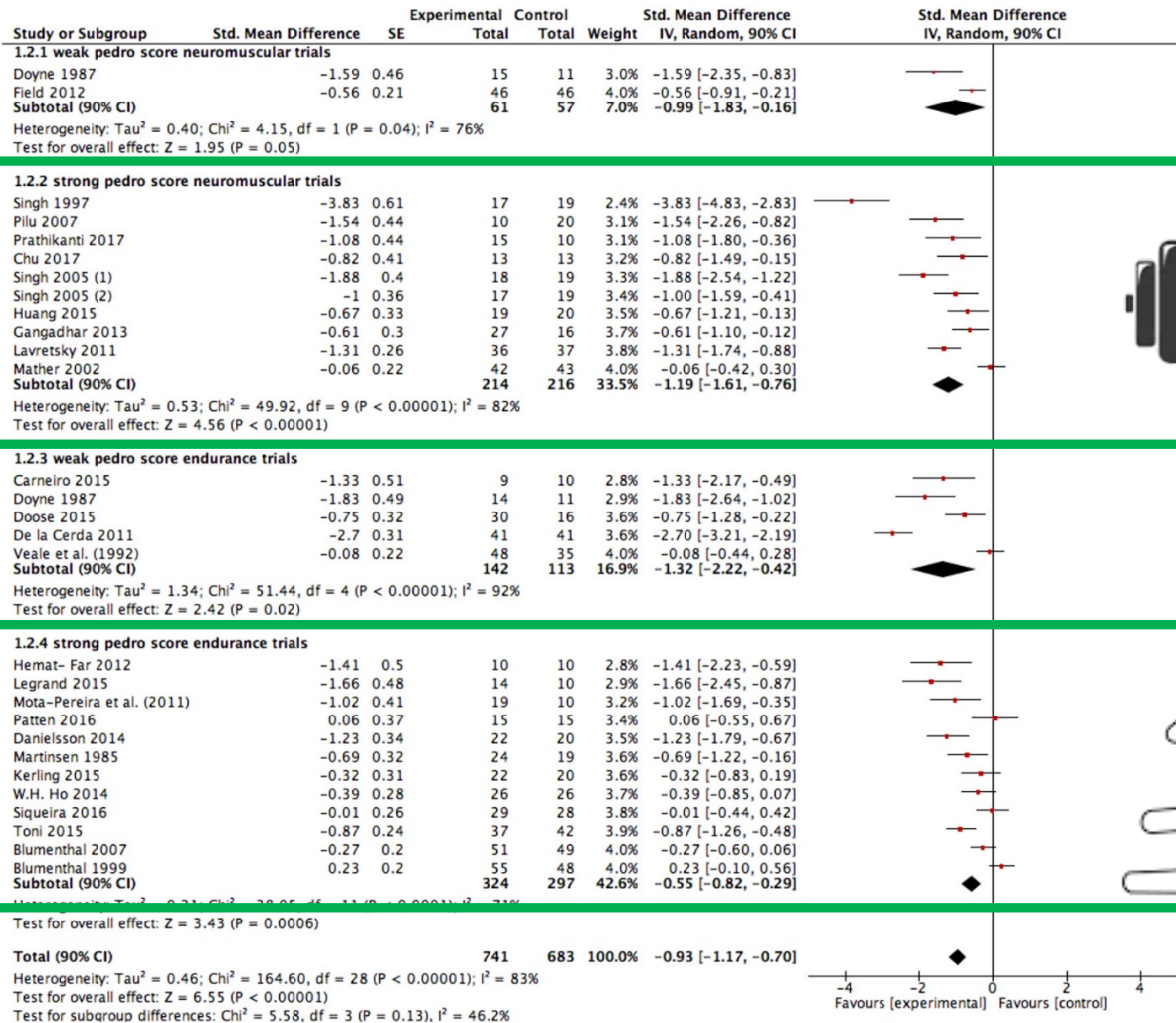
Moderating Effects of Exercise Duration and Intensity in Neuromuscular vs. Endurance Exercise Interventions for the Treatment of Depression: A Meta-Analytical Review

Lukas Nebiker¹, Eric Lichtenstein¹, Alice Minghetti¹, Lukas Zahner¹, Markus Gerber¹, Oliver Faude¹ and Lars Donath^{2*}

¹ Department of Sport, Exercise and Health, University of Basel, Basel, Switzerland, ² Department of Intervention Research in Exercise Training German Sport University Cologne, Köln, Germany

OPEN ACCESS

27 Trials / 1500 Patient*innen: Kraft vs. Ausdauer



SMD: -1.2
(CI: -1.6 – 0.8)

>



SMD: -0.55
(CI: -0.8 – 0.29)

Favours [experimental] Favours [control]

Meta-regression: “10er – Regel“



10 min länger

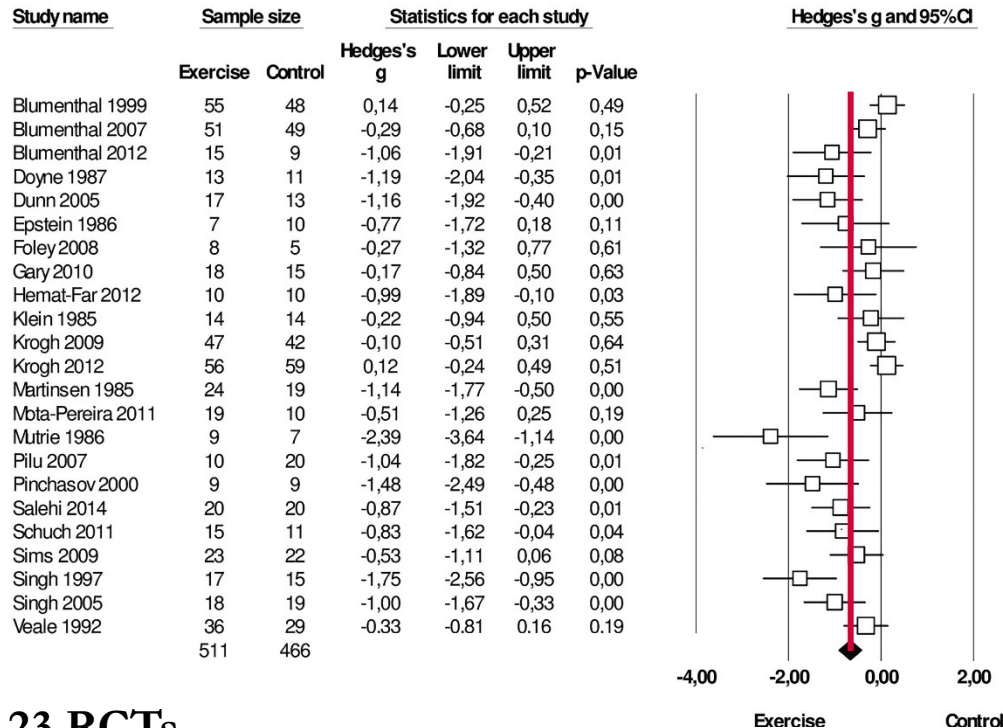
Moderator	Estimate	Standard error	<i>p</i>	95 %-CI
Intercept	2.46	2.82	0.38	−3.07; 7.99
Duration of sessions	−0.06	0.02	0.01	−0.11; −0.01
Frequency	−0.24	0.18	0.18	−0.60; 0.12
Intensity	0.01	0.02	0.81	−0.04; 0.05
Number of sessions	0.01	0.01	0.50	−0.01; 0.02



10% intensiver

Moderator	Estimate	Standard error	<i>p</i>	95 %-CI
Intercept	3.133	1.999	0.12	−0.78; 7.05
Duration of sessions	−0.009	0.011	0.44	−0.03; 0.01
Frequency	0.002	0.171	0.99	−0.33; 0.34
Intensity	−0.054	0.028	0.05	−0.11; −0.00
Number of sessions	−0.017	0.02	0.38	−0.06; 0.02

Intensität der RCTs

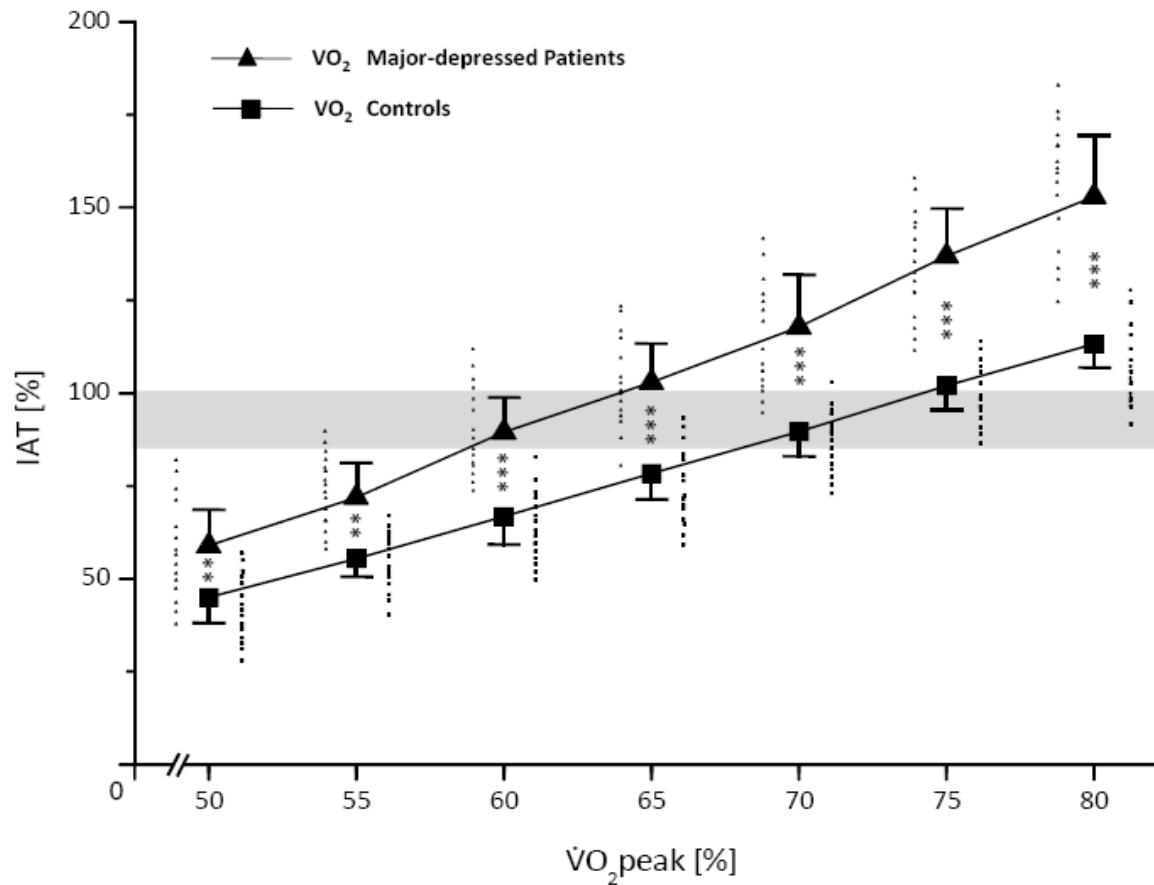


23 RCTs

SMD: -0.68
(CI: -0.44; -0.92) → SMD: -0.22
(Follow-Up)

Supervision
2-4 sessions/Woche
30-45 min / Session
70-80% HR_{max}
60-70% VO_{2max}
50-75 (80)% of 1 RM

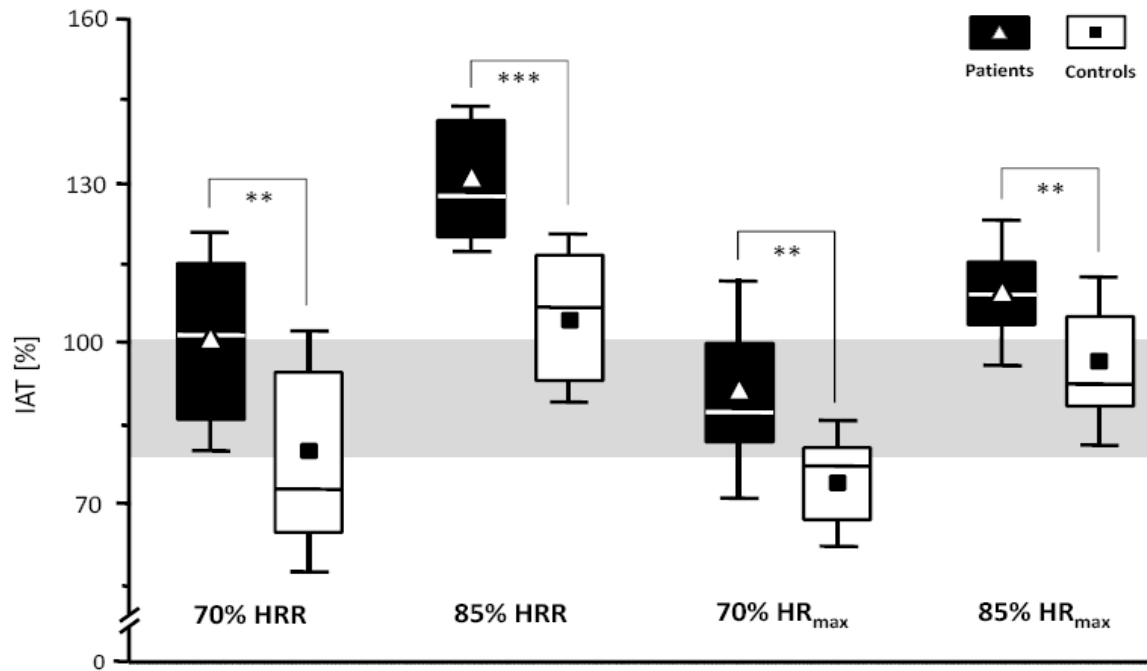
Intensitätsfestlegung (Sauerstoffaufnahme)



Supervision
2-4 sessions/Woche
30-45 min / Session
70-80% HR_{max}
60-70% VO_{2max}
50-75 (80)% of 1 RM

Donath et al. (2010) Dissociation of performance parameters at the IAT requires specific exercise recommendations for depressed patients. Prog Neuropsychopharmacol Biol Psychiatry.

Intensitätsfestlegung (Herzfrequenz)



Supervision

2-4 sessions/Woche

30-45 min / Session

70-80% HR_{max}

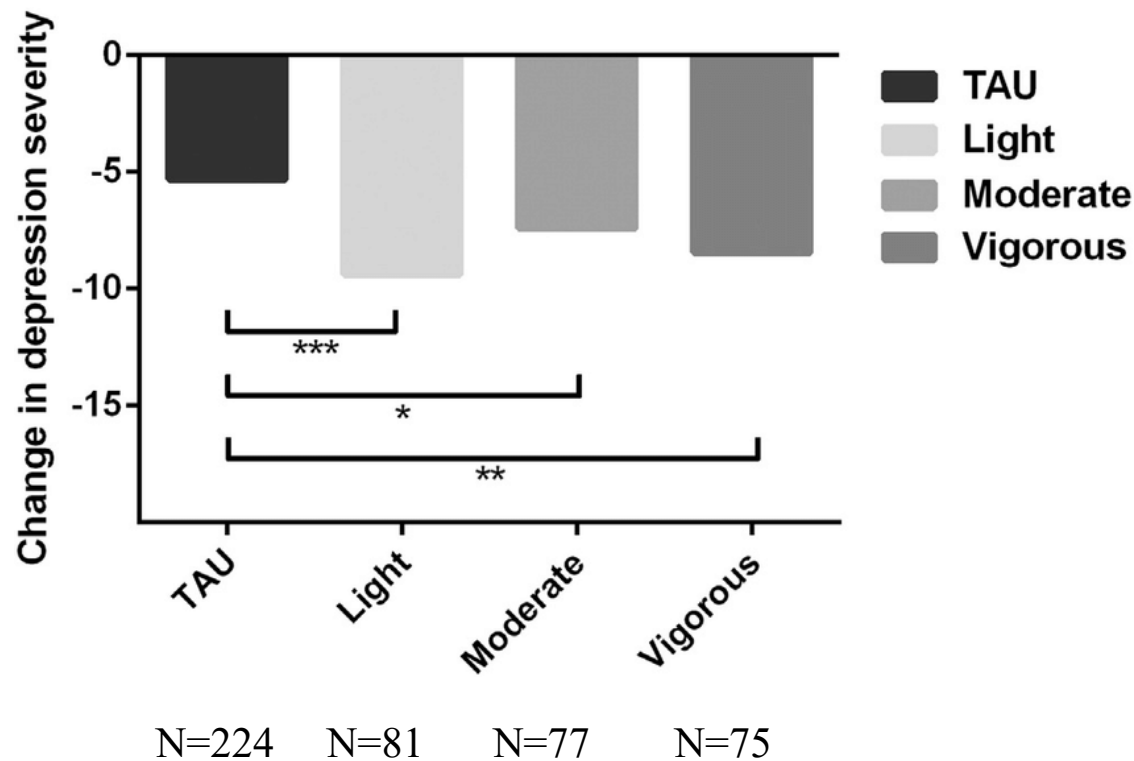
60-70% VO_{2max}

50-75 (80)% of 1 RM

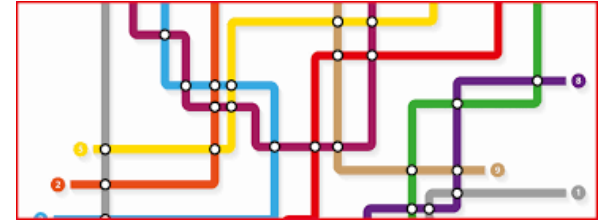
Donath et al. (2010) Dissociation of performance parameters at the IAT requires specific exercise recommendations for depressed patients. Prog Neuropsychopharmacol Biol Psychiatry.

Training fast or slow?

Regassa study (RCT, 20% drop-out)
(Sweden 2011–2013)



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-

Top 10 Trainingsbarrieren und Präferenzen



Motivation (70% - 80%)

Stimmung (60% - 70%)

Müdigkeit (60% - 70%)

Nicht in der Lage (25% - 35%)

Zeit (14% - 26%)

Kein Genuss (20-30%)

Angst vor Verletzungen (20%)

Unbequem (21% - 24%)

Mangelnder Support (10-25%)

Zugang (5% - 10%)

Allein (70%)

Lange und nicht oft (66%)

Zu Hause (62%)

Coaching (50%)

3-4 mal/Woche (40%)

täglich (32%)

Länger als 8 Wochen (40%)

Moderate Intensität (45%)

Walking (30%)

Krafttraining (23%)

Top 10 Trainingsbarrieren und Präferenzen



Motivation (70% - 80%)

Allein (70%)

Stimmung (60% - 70%)

Lange und nicht oft (66%)

We need appealing, tailored, supportive, accessible, supervised, regular and sustainable exercise programs

Angst vor Verletzungen (20%)

Länger als 8 Wochen (40%)

Unbequem (21% - 24%)

Moderate Intensität (45%)

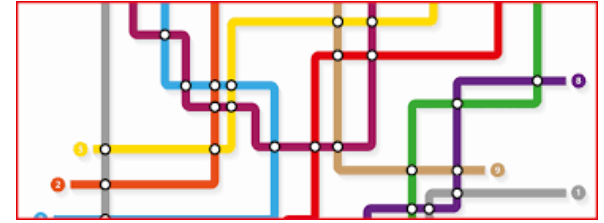
Mangelnder Support (10-25%)

Walking (30%)

Zugang (5% - 10%)

Krafttraining (23%)

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-

Sprint Interval Training (SIT) – kurze Historie

Short-term sprint interval *versus* traditional endurance training: similar initial adaptations in human skeletal muscle and exercise performance

Martin J. Gibala¹, Jonathan P. Little¹, Martin van Essen¹, Geoffrey P. Wilkin¹, Kirsten A. Burgomaster¹, Adeel Safdar², Sandeep Raha² and Mark A. Tarnopolsky²

¹Exercise Metabolism Research Group, Department of Kinesiology, McMaster University, Hamilton, Ontario, L8S 4K1, Canada

²Departments of Pediatrics and Medicine, McMaster University, Hamilton, Ontario, L8N 3Z5, Canada

Similar metabolic adaptations during exercise after low volume sprint interval and traditional endurance training in humans

Kirsten A. Burgomaster¹, Krista R. Howarth¹, Stuart M. Phillips¹, Mark Rakobowchuk¹, Maureen J. MacDonald¹, Sean L. McGee² and Martin J. Gibala¹

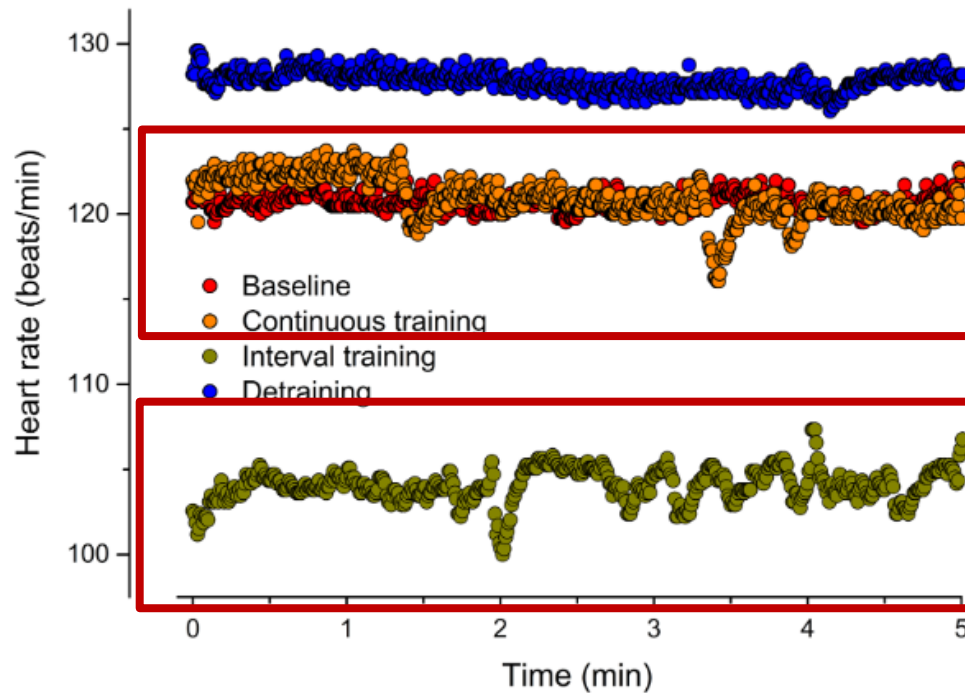
¹Exercise Metabolism Research Group, Department of Kinesiology, McMaster University, Hamilton, Ontario, Canada L8S 4K1

²Department of Physiology, University of Melbourne, Melbourne, Victoria, Australia 3010

Sprint Interval Training (SIT) – Case Report

RCT (2-armig) | 4 Wochen | 3 Session / Woche

Resting heart rate



- 20' Ausdauertraining
(60% P_{max})

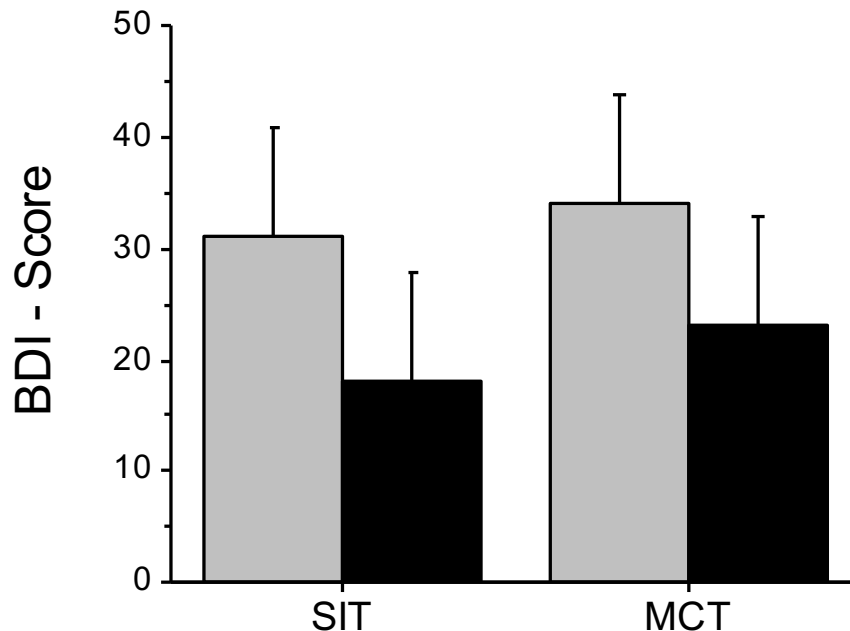
- 25mal 30 secs Sprint-interval
(80% P_{max})



Herbsleb et al. (2015) Differential cardiac effects of aerobic interval training versus moderate continuous training in a patient with schizophrenia: a case report. Front Psychiatry

BDI – SIT vs. MCT (37 ± 8 years, n=28 each group)

ANCOVA: $p = 0.10$, $\eta_p^2 = 0.26$, 70% possibly beneficial



SIT:

- ✓ 12.5 vs. 20 min exercise time
- ✓ HR-training: 5 – 10 beats/min 
- ✓ RPE: 13.1 (1.2) vs. 14.2 (1.3)
- ✓ comparable changes in:
 - P_{peak} : 12 [-8 to 32] Watts
 - VO_{2peak}/kg : 2.1 [0.9 to 3.4] L/min
 - $VO_{2@VT_1}$: 1.0 [-0.5 to 2.5] L/min
 - HR_{rest} : -1.5 [-4 to 1] beats/min

1st Intervall-training “more enjoyable”?

[J Sports Sci.](#) 2011 Mar;29(6):547-53. doi: 10.1080/02640414.2010.545427.

High-intensity interval running is perceived to be more enjoyable than moderate-intensity continuous exercise: implications for exercise adherence.

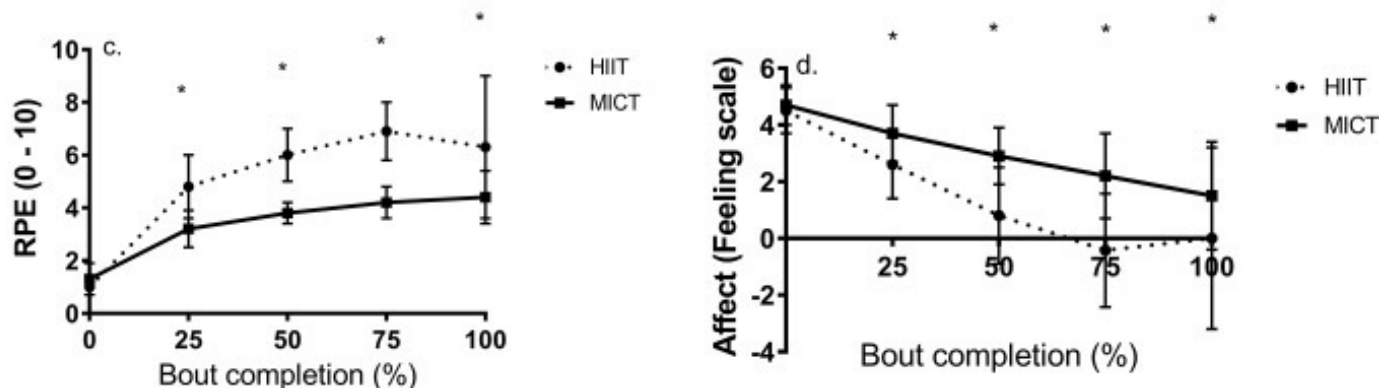
[Bartlett JD](#)¹, [Close GL](#), [MacLaren DP](#), [Gregson W](#), [Drust B](#), [Morton JP](#).

[PLoS One.](#) 2017 Jan 11;12(1):e0166299. doi: 10.1371/journal.pone.0166299. eCollection 2017.

High-Intensity Interval Training Elicits Higher Enjoyment than Moderate Intensity Continuous Exercise.

[Thum JS](#)¹, [Parsons G](#)¹, [Whittle T](#)¹, [Astorino TA](#)¹.

[+ Author information](#)



Zusammenfassung (Big Five)

1 **Depression:** Höchste Krankenlast (DALY)

2 **↑ Stress response:** Dysfunktion im Herzkreislaufsystem

3 **Ausdauer und Krafttraining:** moderate Effekte („10er Regel“)

4 **Barriers & Preferences (5s):**

Sustainable, Supervision, Support, Stimulating, Solo

5 **SIT ähnlich MCT:** ($25 @ 80\% P_{\text{peak}} \times 30 \text{ bouts}$): (“12er Regel”)

Thank you for your attention.

L.donath@dshs-koeln.de



@LarsDonath



https://www.researchgate.net/profile/Lars_Donath

