Alte Muskeln, alte Knochen-was tun?
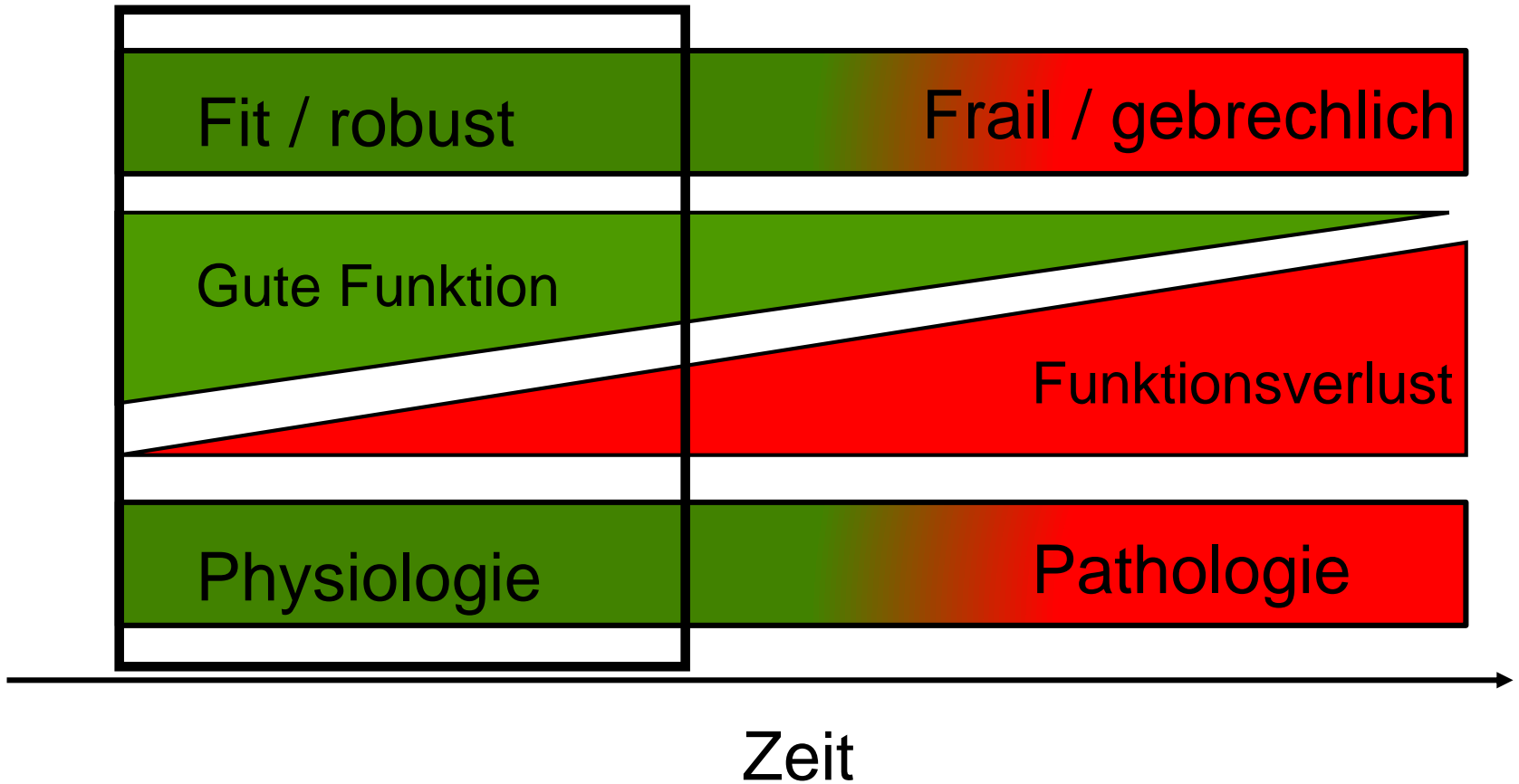
2. St. Katharinentaler Herbstsymposium

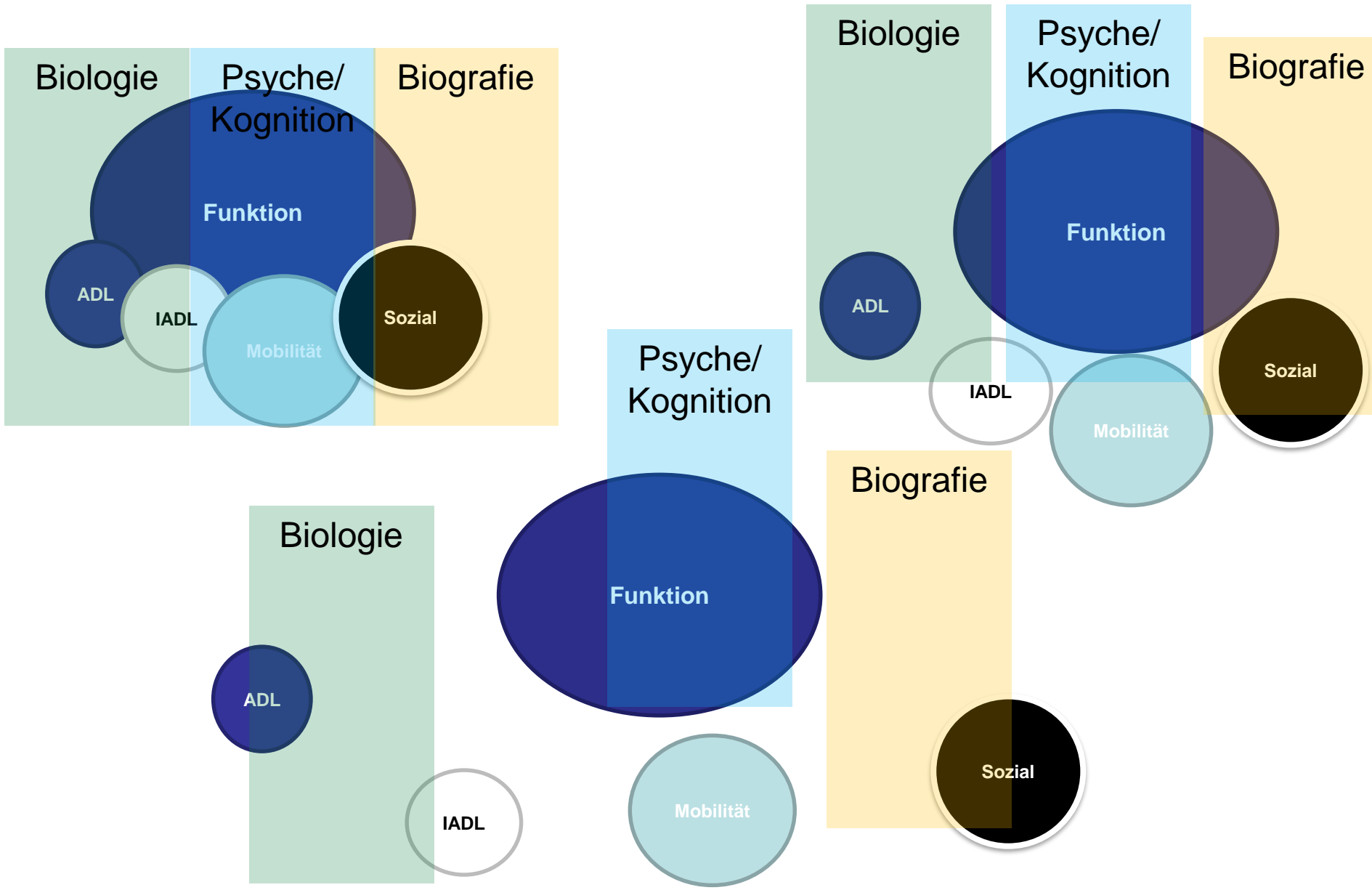St. Katharinental, 07.11.2019

PD Dr. med. Thomas Münzer

Geriatrische Klinik St. Gallen und Universität Zürich

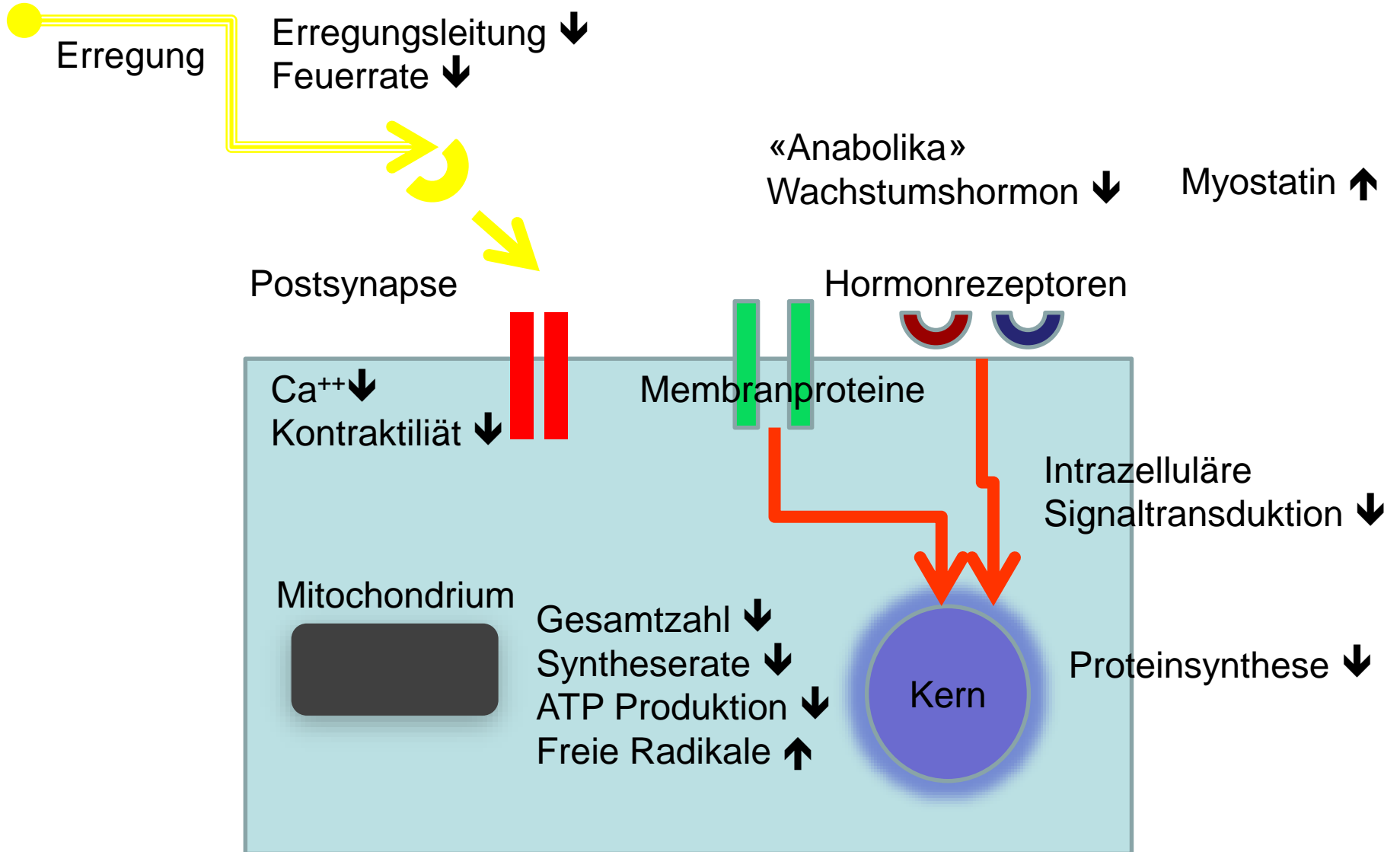Board Member European Academy for Medicine of Aging
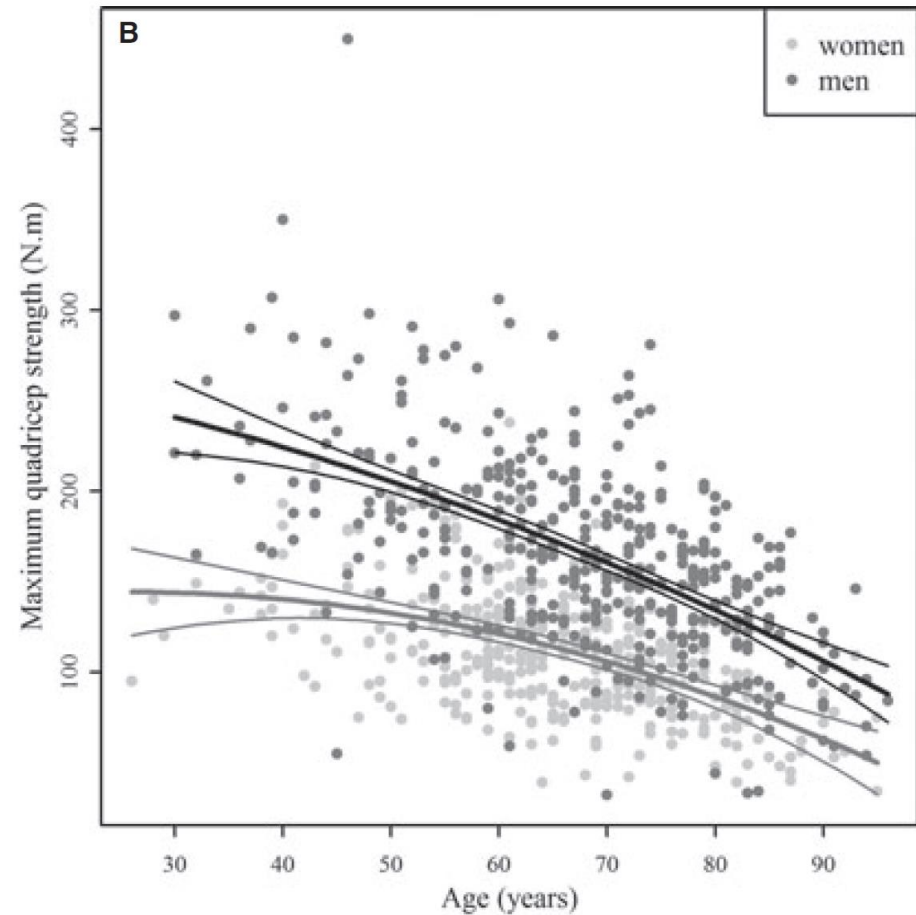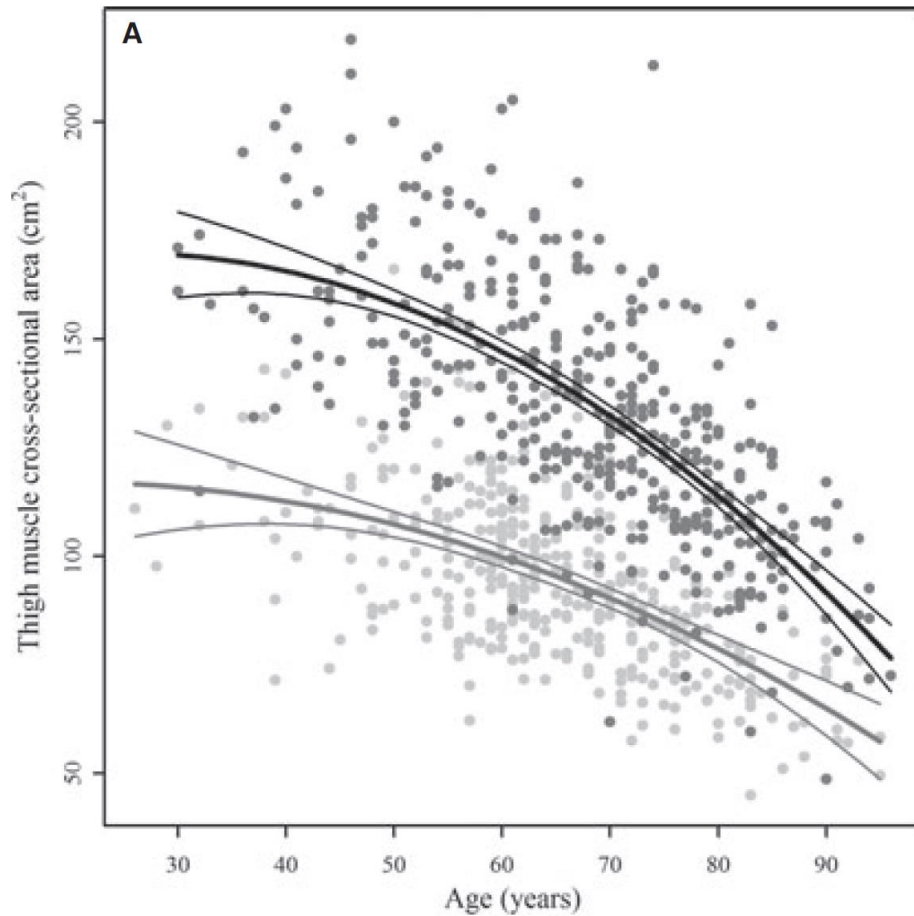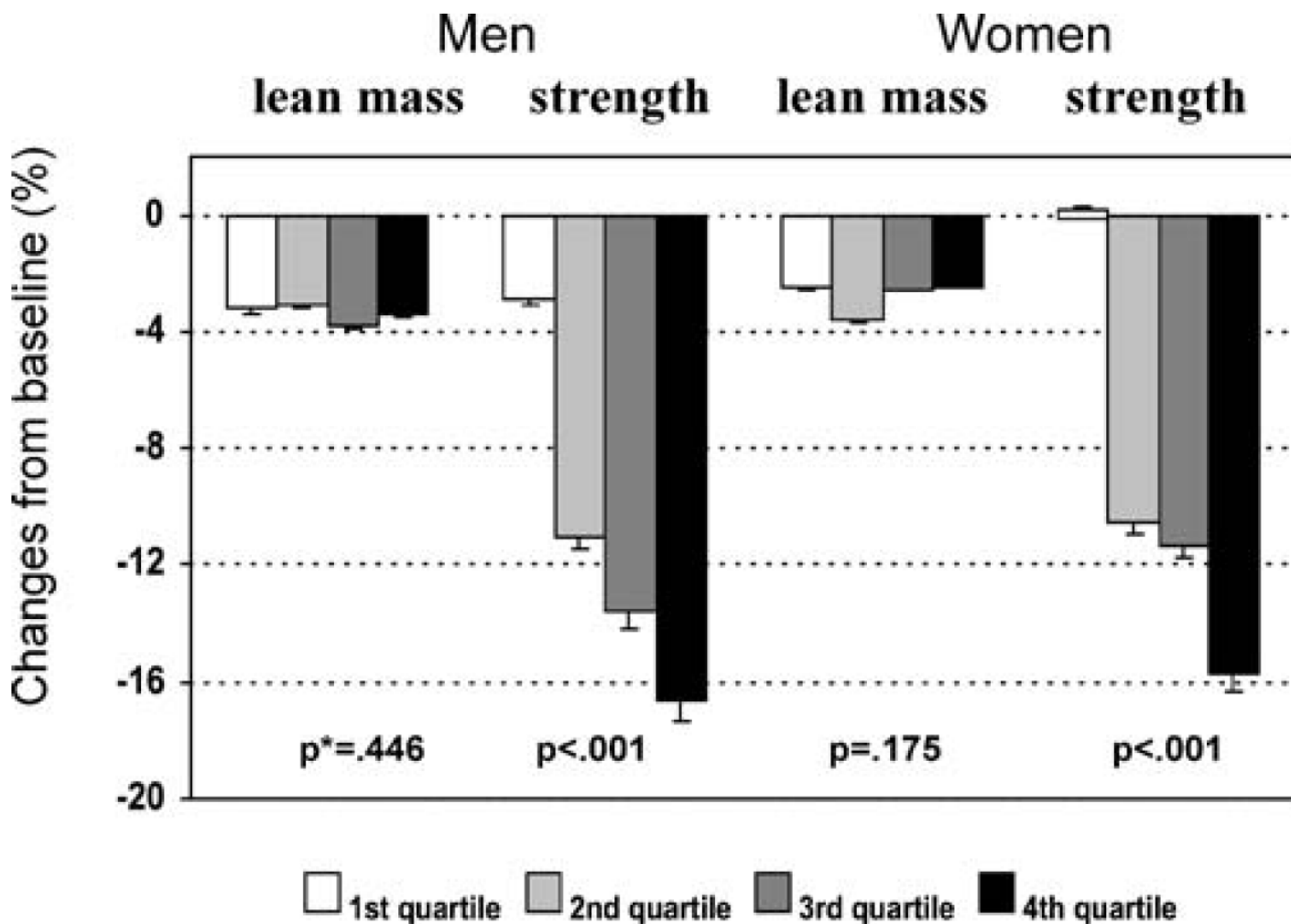
Biologie versus Pathologie

Funktionelle Desintegration

Alte Muskeln

Erregung

Erregungsleitung ⬇
Feuerrate ⬇

«Anabolika»
Wachstumshormon ⬇   Myostatin ⬆

Postsynapse   Hormonrezeptoren

Ca^{++}⬇
Kontraktiliät ⬇   Membranproteine   Intrazelluläre
Signaltransduktion ⬇

Mitochondrium

Gesamtzahl ⬇
Syntheserate ⬇   Proteinsynthese ⬇
ATP Produktion ⬇
Freie Radikale ⬆   Kern

Masse und Kraft ⬇

⬇ Kraft ≠ ⬇ Masse

Rolle der Muskulatur

Erfolg
Funktion stabilisiert
Robust, viel Muskeln?

Misserfolg
Funktionsverlust
Sarkopenie?
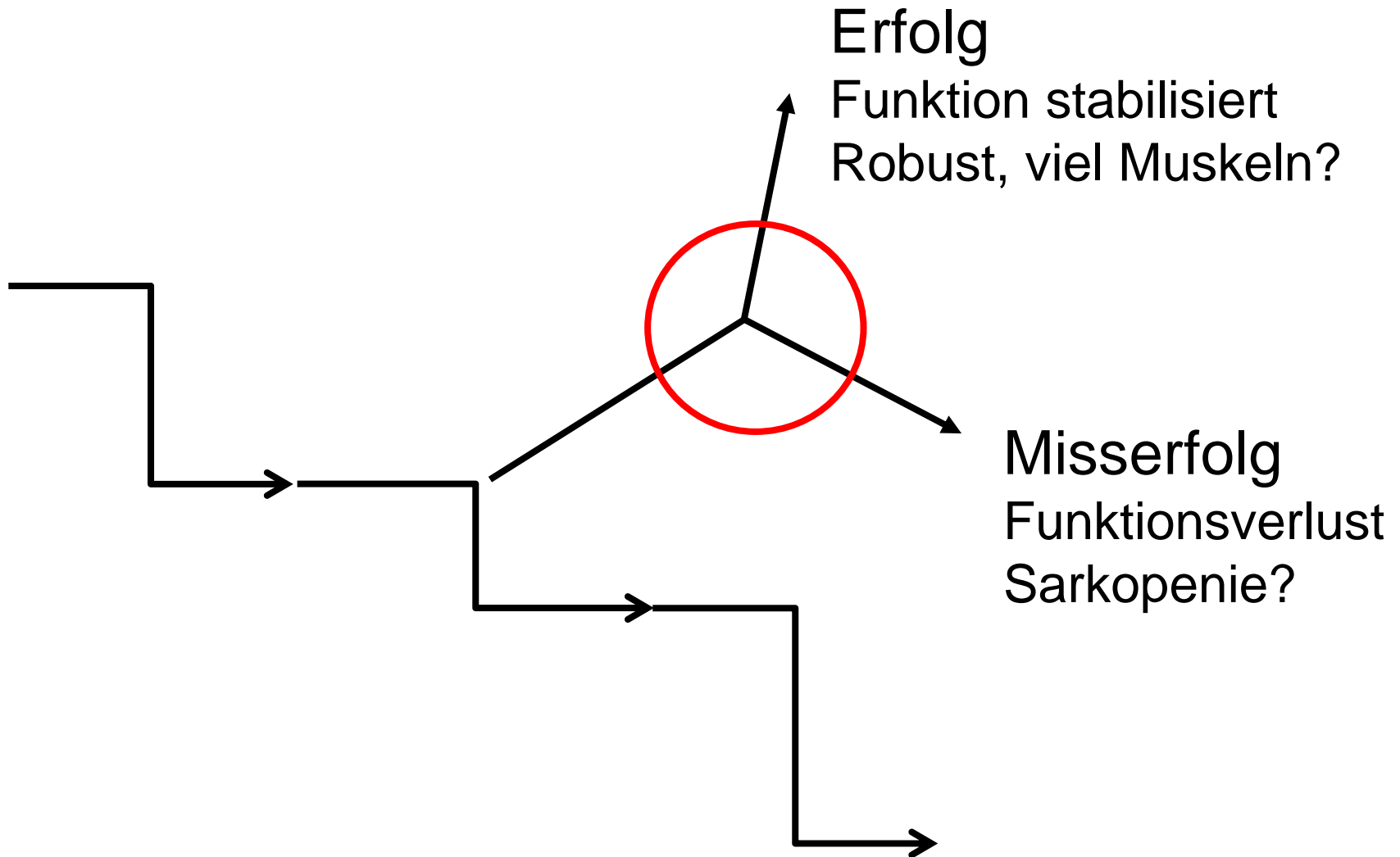
Sarkopenie Inhalt

- Definition
- Mechanismus
- Prävalenz
- Konsequenzen
- Assessment
- Management
- Zusammenfassung
- Ausblick

Sarkopenie ist nicht

- Tumorkachexie

- Kardiale oder pulmonale Kachexie

- Verlust von Muskeln im Rahmen von chronischen entzündlichen Erkrankungen

- Gemeinsamkeiten

  – Entzündungsmediatoren ↑

  – Tumornekrosefaktoren ↑

Definition 2019

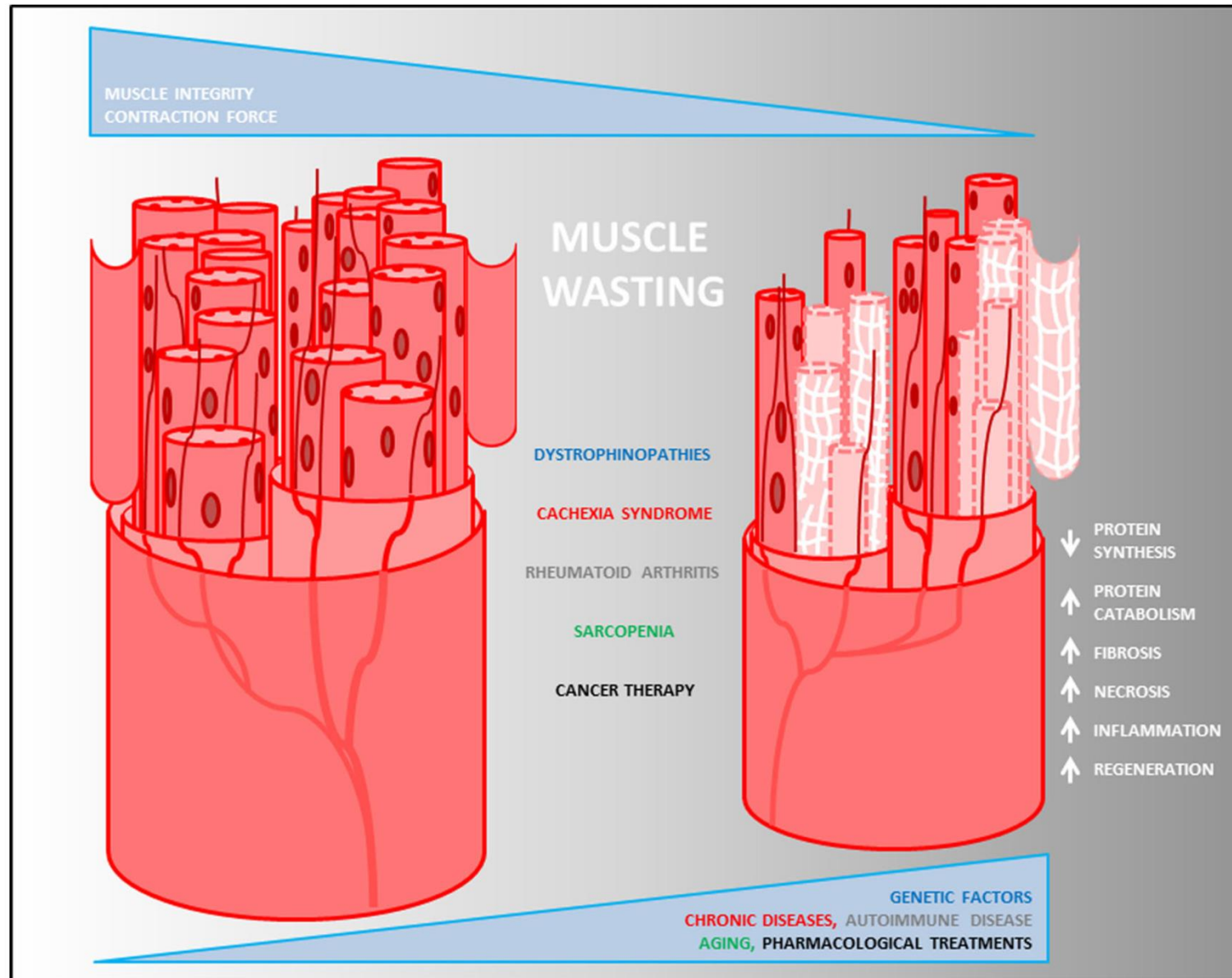**Table 1.** 2018 operational definition of sarcopenia

Probable sarcopenia is identified by Criterion 1.
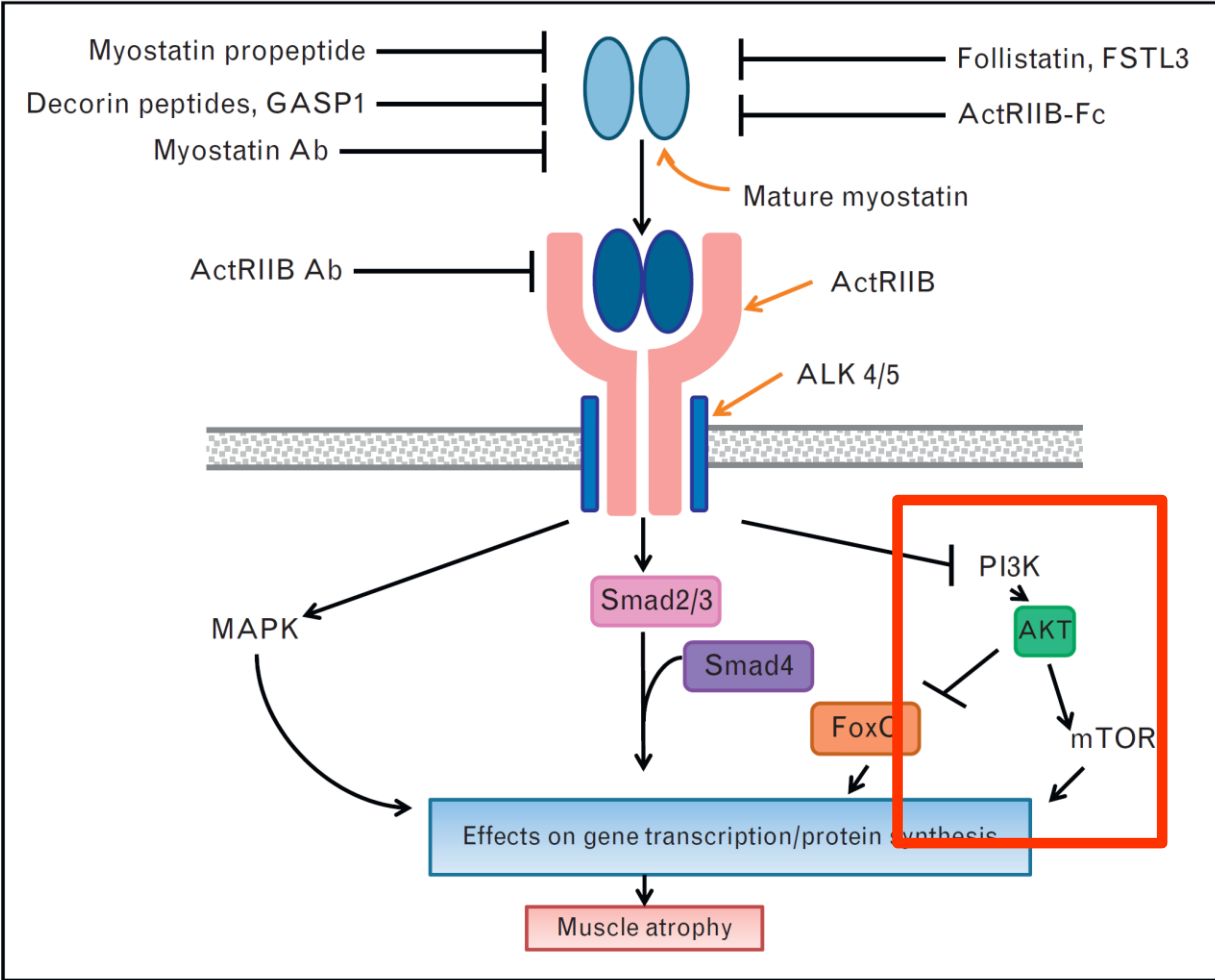Diagnosis is confirmed by additional documentation of Criterion 2.
If Criteria 1, 2 and 3 are all met, sarcopenia is considered severe.

(1) Low muscle strength
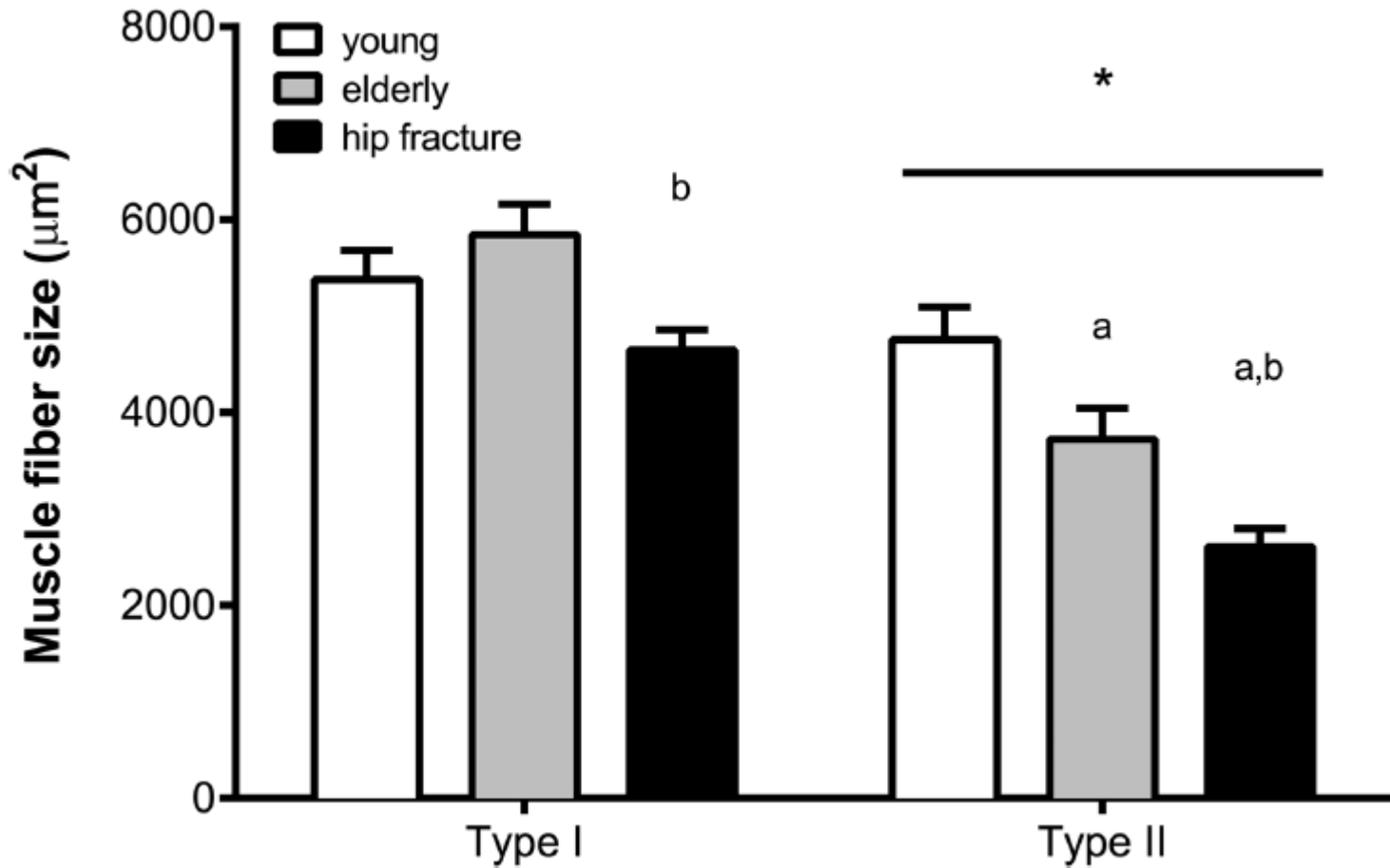(2) Low muscle quantity or quality
(3) Low physical performance

Sarkopenie im Überblick

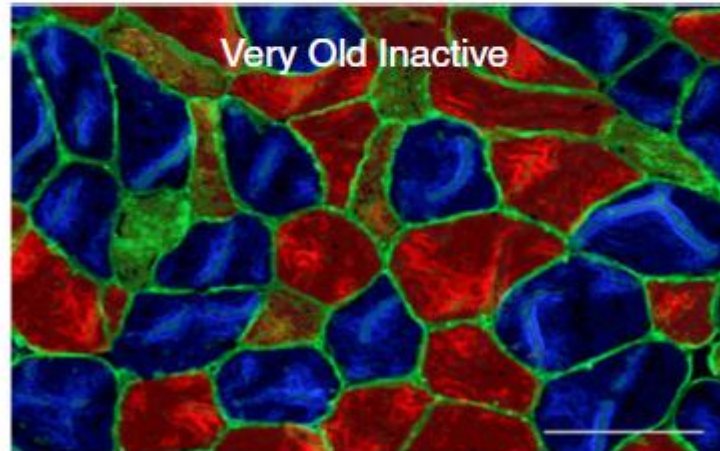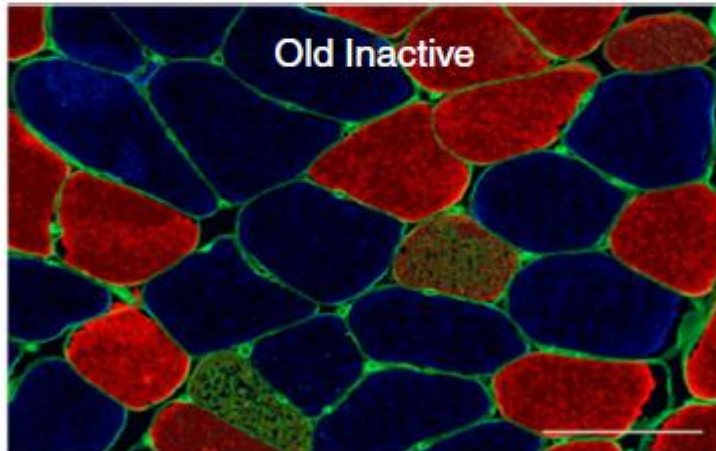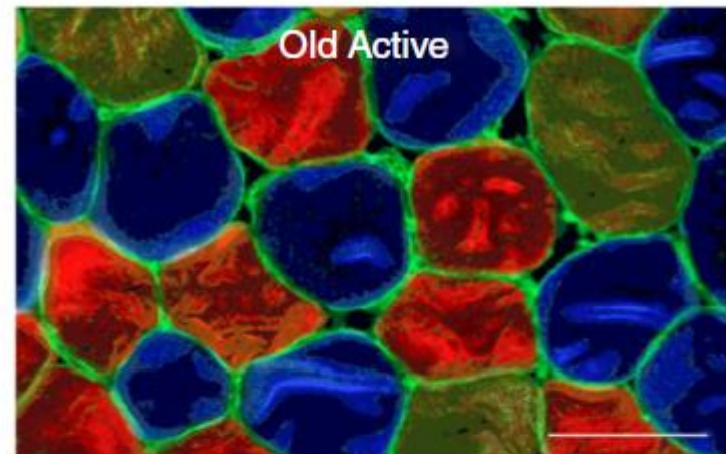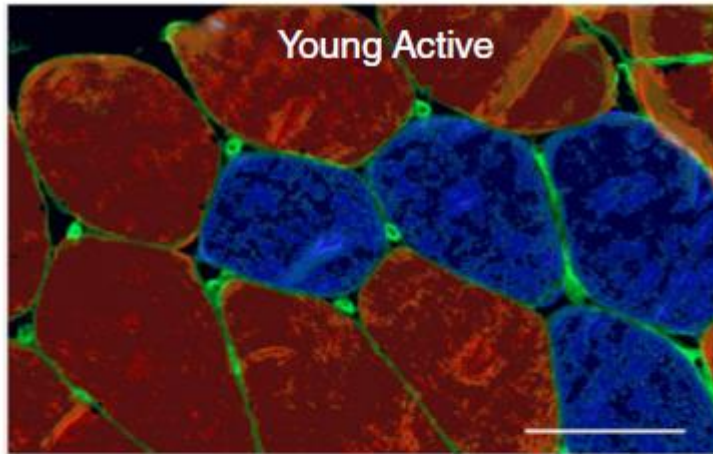# Myostatin

Betroffene Fasern

Alter und Fasern

Prävalenz Europa
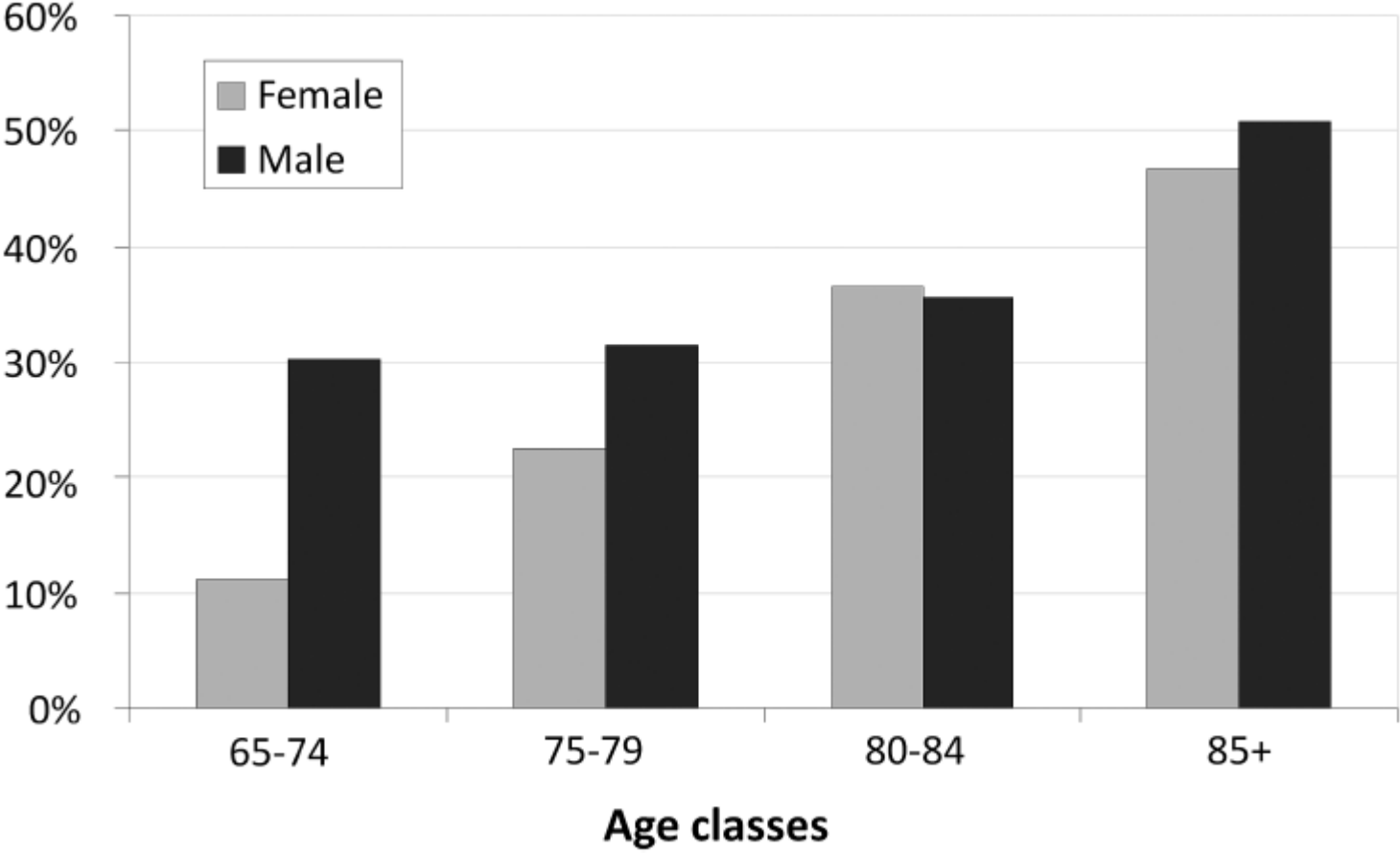
Prävalenz Schweiz

Wohnbevölkerung, am 31.12.2017

	Total	Sarkopen	
Total	8484130		
65-74	821853	165000	
75-79	294176	88200	
80-84	217197	76000	
85+	217139	97700	
Total>65	**1550365**	**426000**	**27.5%**

Konsequenz für Betroffene

- Gewichtsverlust

- Langsamer Gang

- Stürze / Frakturen

- Hilfsbedürftigkeit

- Verlust der Autonomie

Polymedikation
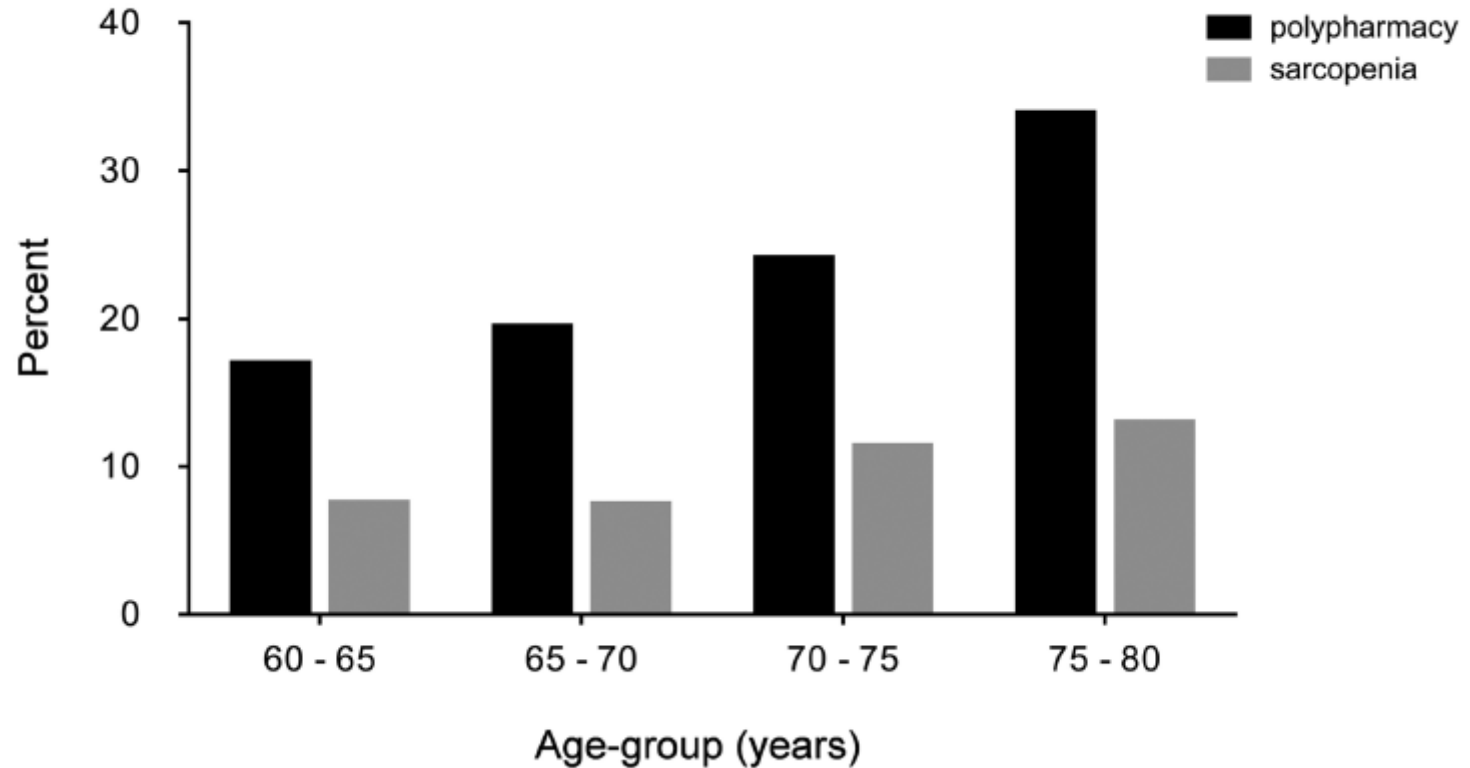
Polymedikation

	Adjusted odds ratio[†] (95% CI)	p value
Polypharmacy	2.24 (1.33–3.75)	.002
Age (years)	1.09 (1.03–1.16)	.006
Low physical activity*	2.00 (1.08–3.70)	.028
Hypertension	3.28 (1.47–7.33)	.004
Diabetes	3.24 (1.96–5.35)	<.001
Joint pain/swelling*	1.66 (1.05–2.60)	.029
eGFR (mL/min/1.73 m²)	1.02 (1.00–1.04)	.040

Muskel und BZ
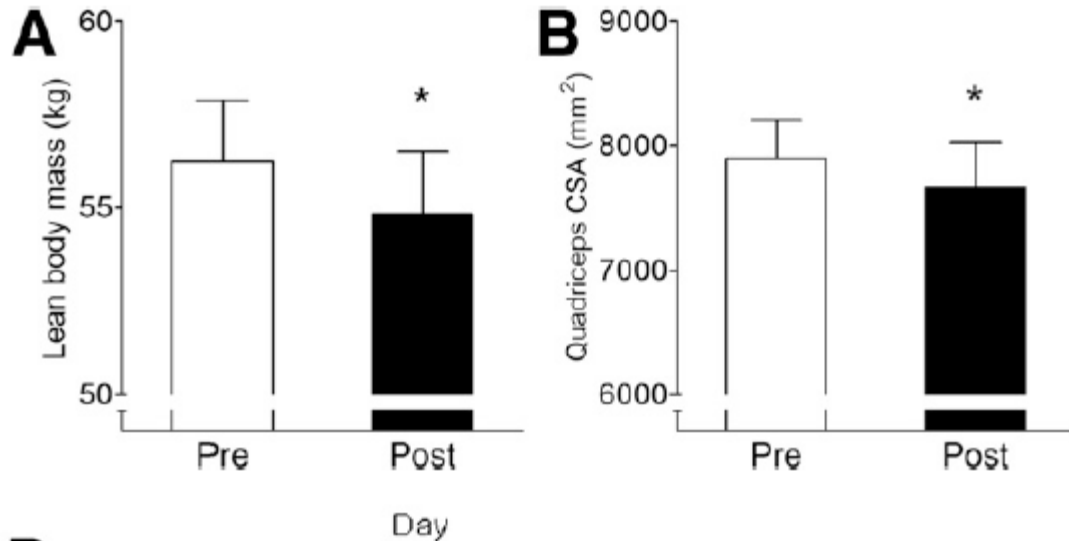
Muskel
Masse ↓
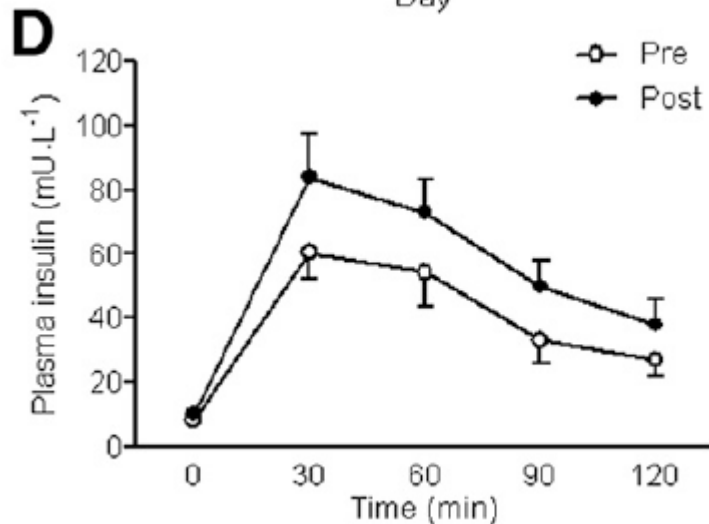
Insulinresistenz ↑

Muskeln und Knochen

Tmem 119
Tmem 176b
MMP-10
Osteoactivin

Differentiation

Myoblast → Preosteoblast → Osteoblast → Mineralization

GH/IGF-1

Vitamin D

Testosterone

Genetic factors → Muscle ↔ Bone ← Mechanical factors

Estrogen
Glucocorticoid
Thyroid hormone

Insulin
Leptin
Adiponectin
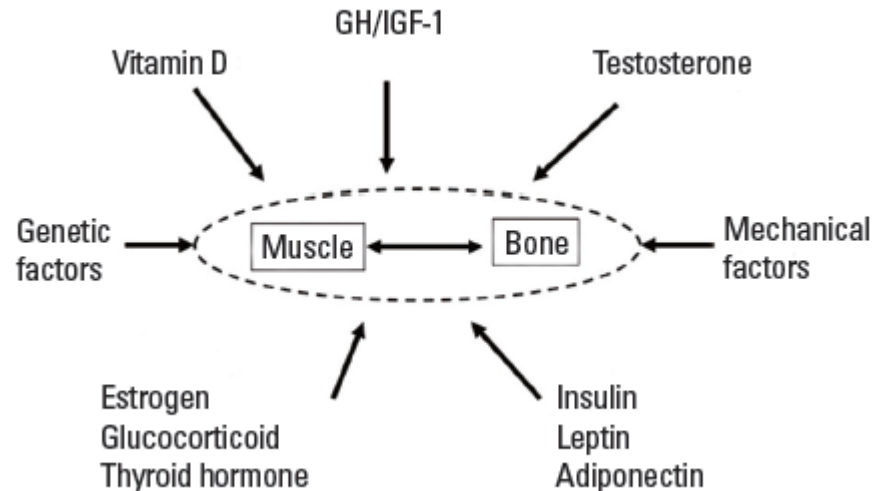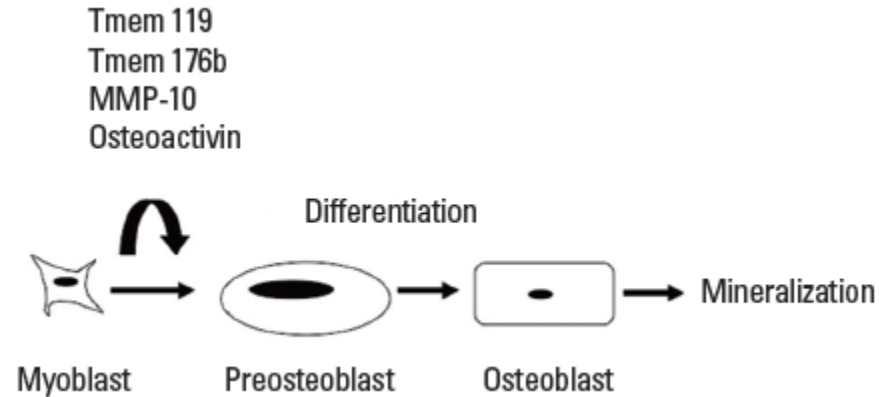
Sarkopenie & Arthrose

Fig. 1 Relationship between aging, obesity and osteoarthritis and the development of sarcopenic obesity

Sarkopenie & Frakturen

Sarkopenie und LBP
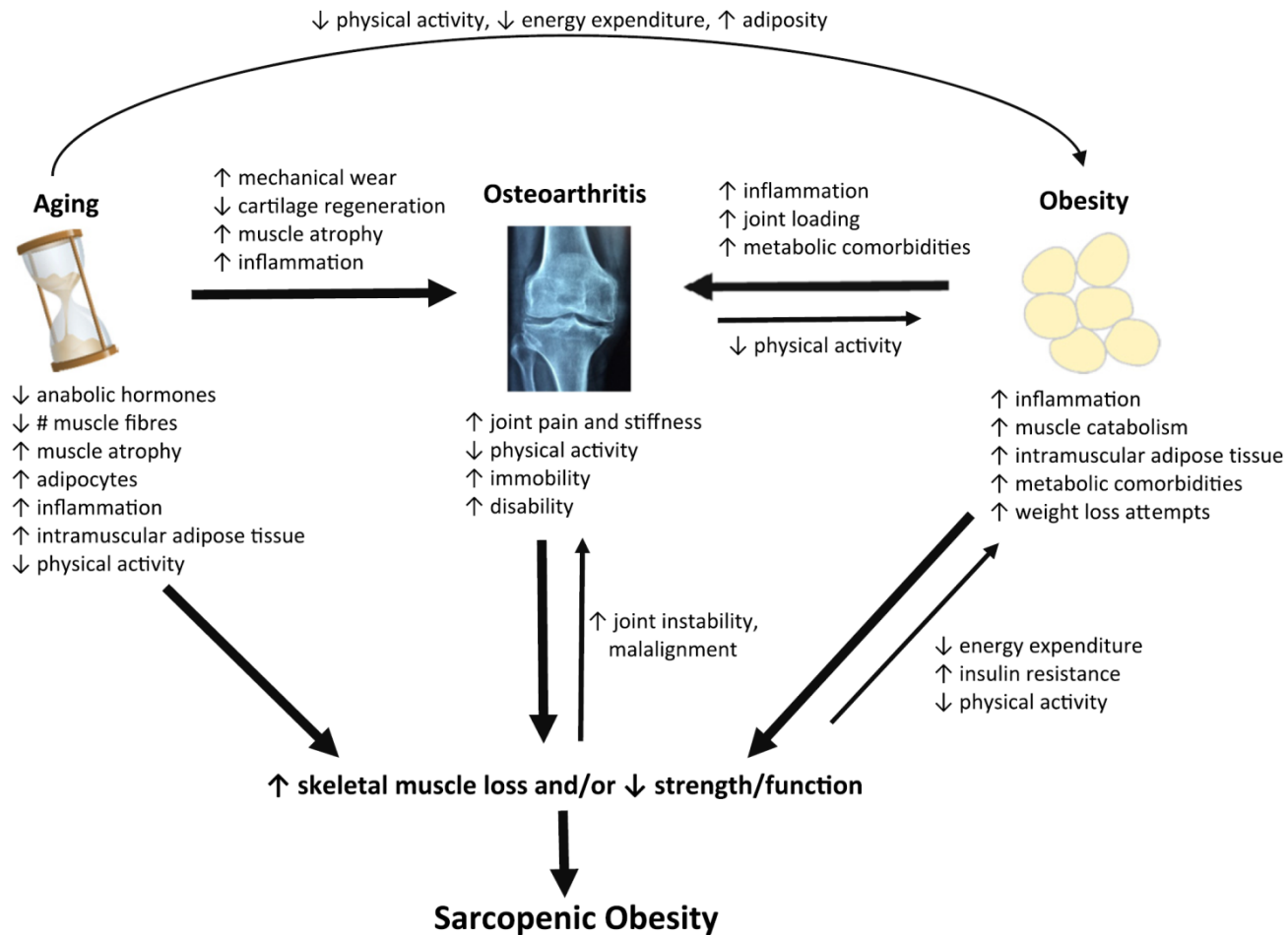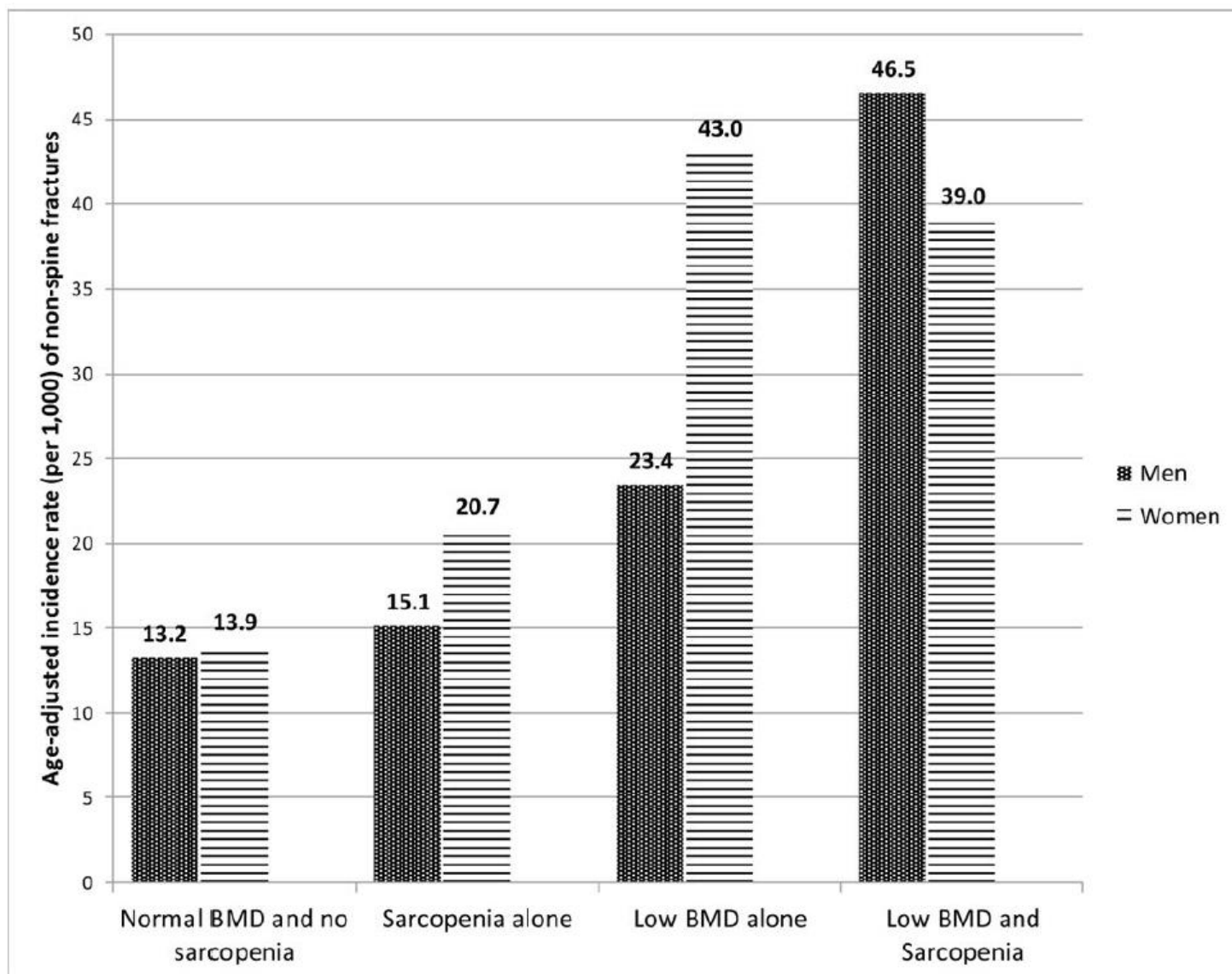
Table 3 Sarcopenia and low back pain

|	Normal (*n* = 166)	Pre-sarcopenia (*n* = 38)	Sarcopenia (*n* = 12)
VAS (mm)	20.5 ± 25.4	21.3 ± 25.8	23.5 ± 22.0
ODI (%)	11.9 ± 12.3	11.2 ± 10.0	25.2 ± 12.3 **
Walking speed (m/s)	1.2 ± 0.3	1.3 ± 0.3	0.9 ± 0.4**
Grip power (kg)	29.8 ± 8.3	26.3 ± 6.4*	20.7 ± 6.0**
SMI (Kg/m^2)	7.0 ± 0.9	5.8±0.7**	6.1±0.6**

(Mean ± SD)
Steel-Dwass
*$P < 0.05$ **$P < 0.01$
Oswestry Disability Index scores were significantly higher in the sarcopenia group than in the other groups ($P < 0.05$). The mean visual analogue scale score in the sarcopenia group was the highest among the three groups, although there were no significant differences among the groups. The mean walking speed in the sarcopenia group was significantly lower than in the other groups. Grip power in the Pre-sarcopenia and Sarcopenia group were significantly lower than in the normal group. SMI in the Pre-sarcopenia and Sarcopenia group were significantly lower than in the normal group
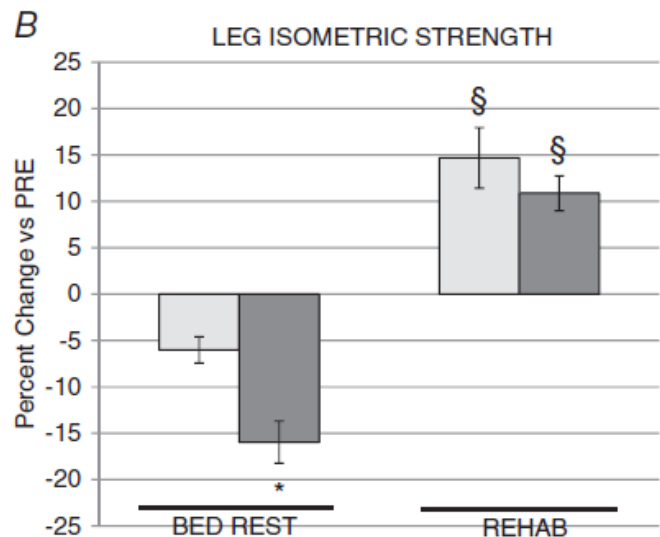
Sarkopenie und WK-Frakturen
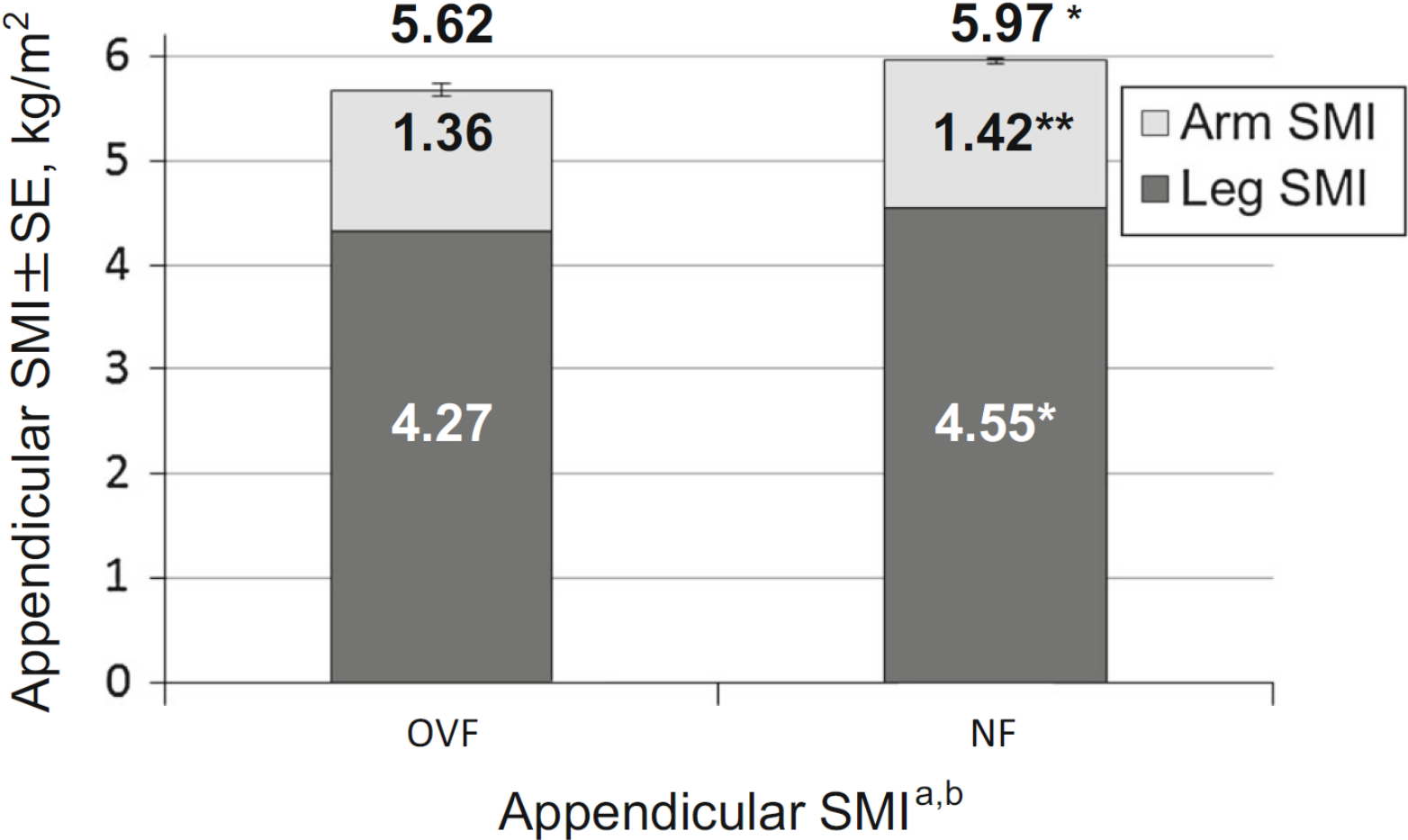
5 d Bettruhe und Training
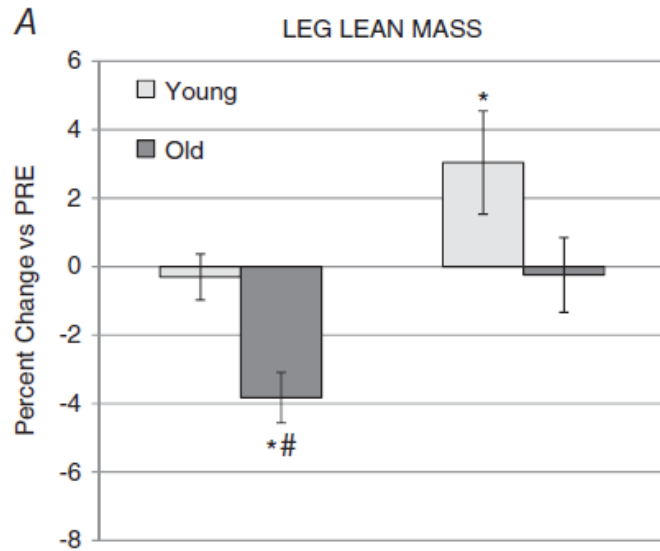
Alt = Masse und Kraft ⬇⬇⬇

Alt = Trainingseffekt ⬇⬇⬇

Klinisches Assessment
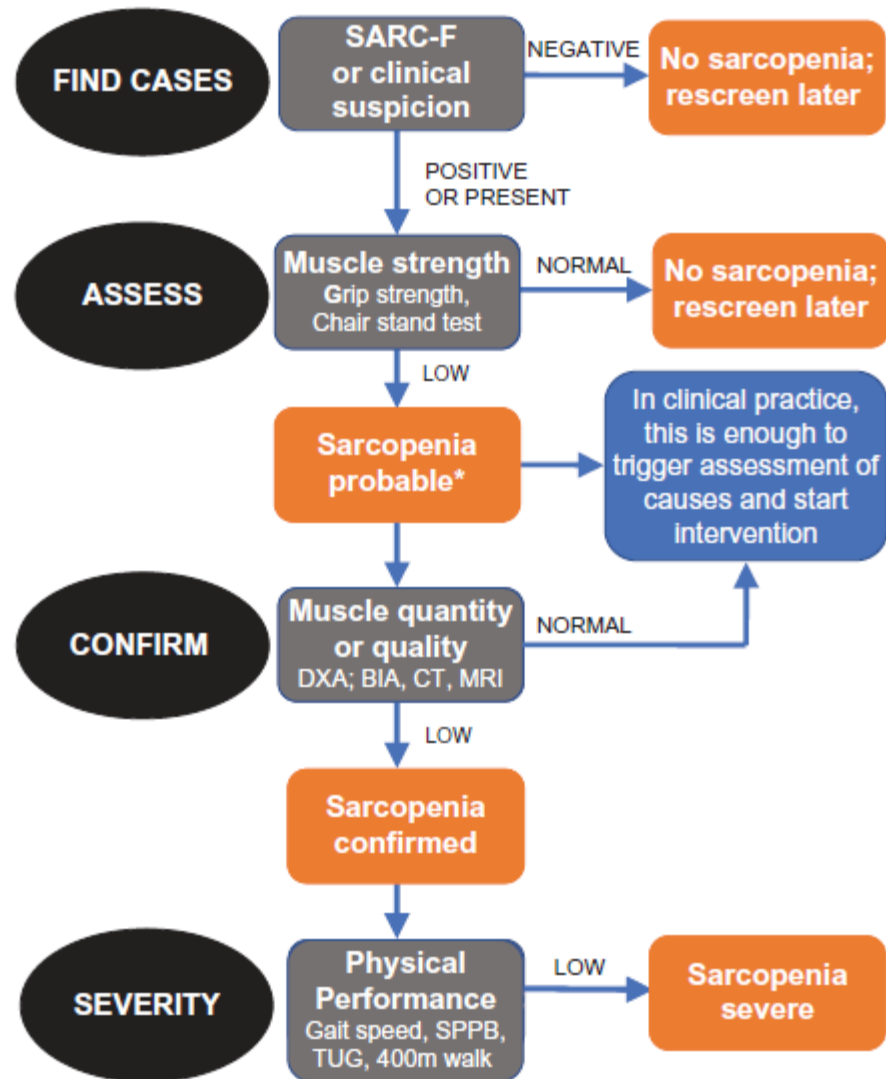
Diagnostik

Variable	Test
Case Finding	SARC-F Fragebogen
Muskelkraft	Handkraft
	Chair stand test
Muskelqualität	DEXA
	BIA
	Lumbale Muskulatur (CT/MRI)
Performance	Habituelle Ganggeschwindigkeit

SARC-F

Table 1
SARC-F Screen for Sarcopenia

Component	Question	Scoring
Strength	How much difficulty do you have in lifting and carrying 10 pounds?	None = 0 Some = 1 A lot or unable = 2
Assistance in walking	How much difficulty do you have walking across a room?	None = 0 Some = 1 A lot, use aids, or unable = 2
Rise from a chair	How much difficulty do you have transferring from a chair or bed?	None = 0 Some = 1 A lot or unable without help = 2
Climb stairs	How much difficulty do you have climbing a flight of 10 stairs?	None = 0 Some = 1 A lot or unable = 2
Falls	How many times have you fallen in the past year?	None = 0 1−3 falls = 1 4 or more falls = 2

Score > 4 Sarkopenie

Referenzdaten UK
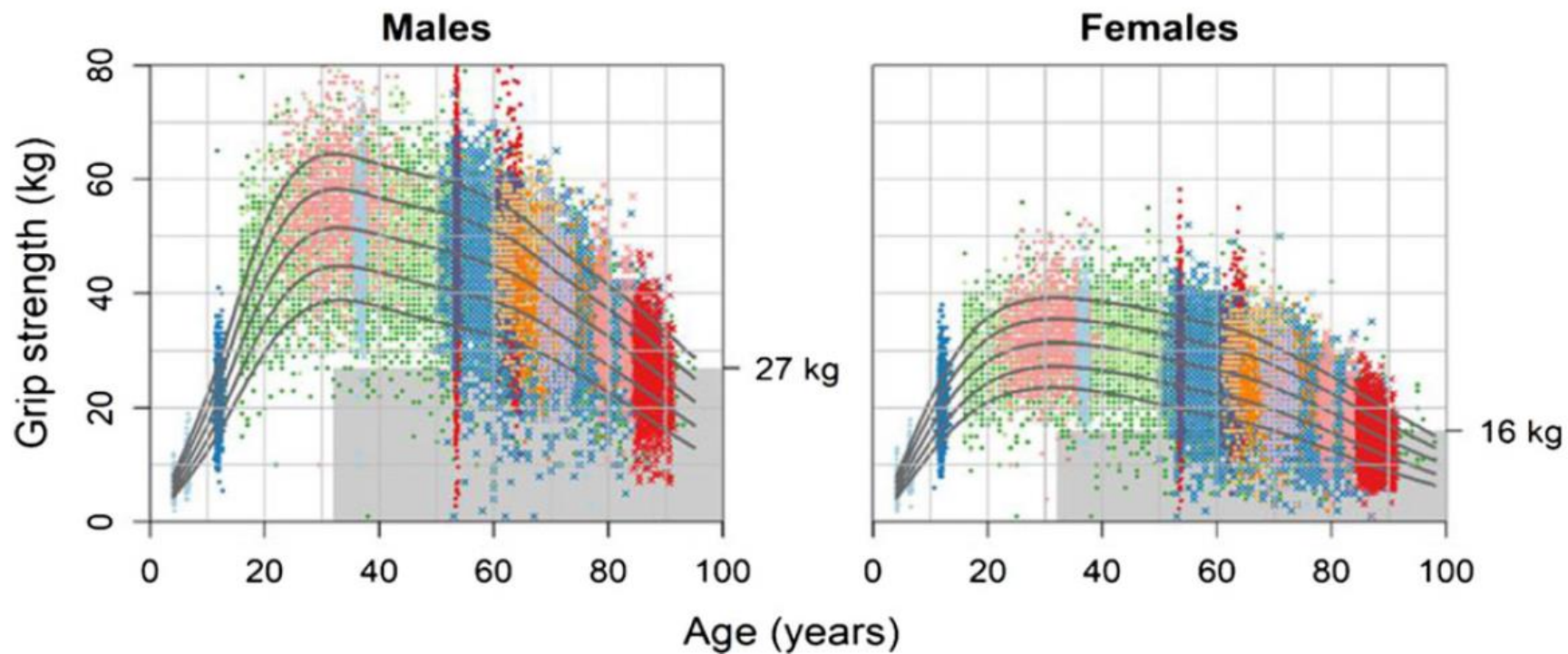
Prävention
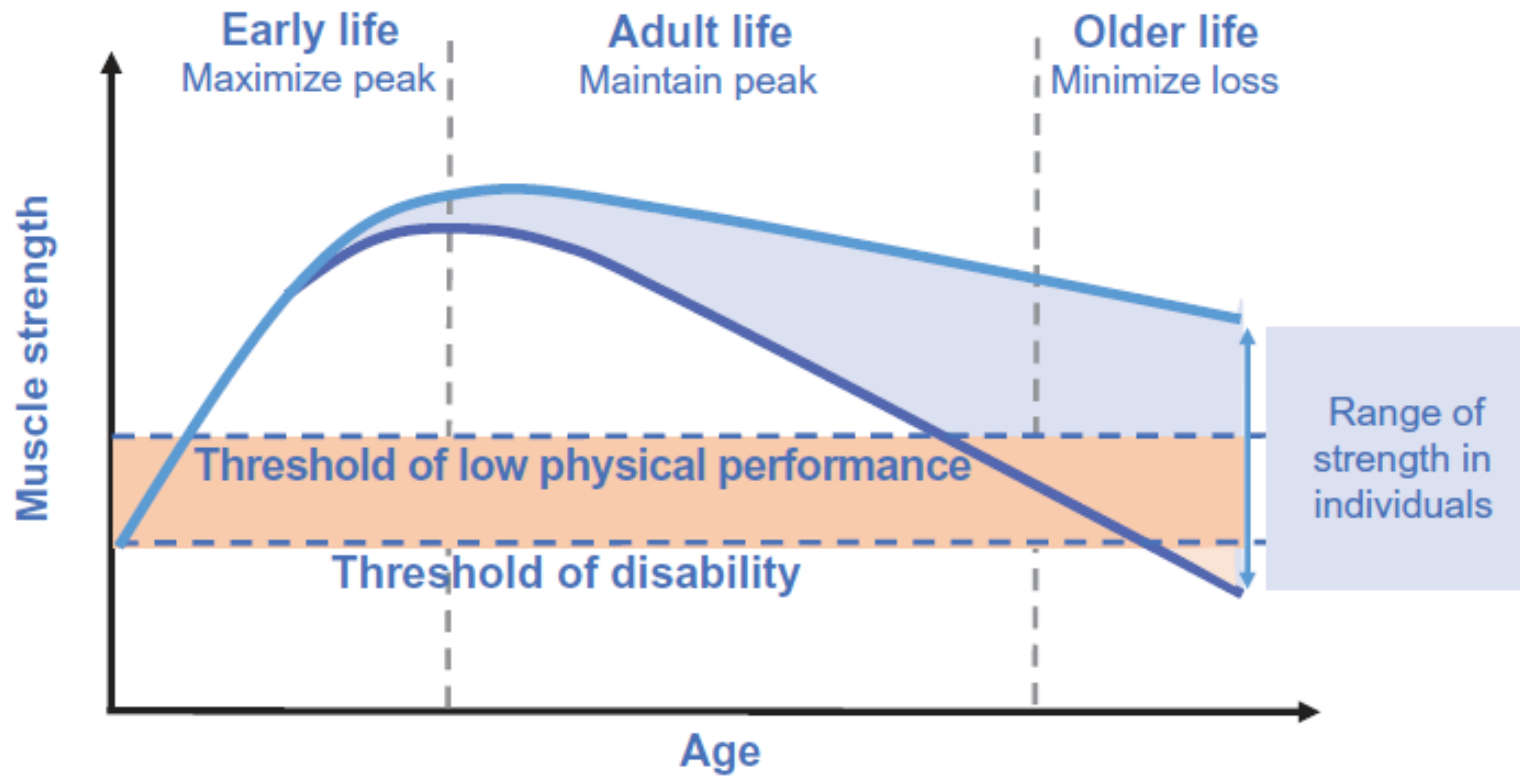
Massnahmen

- Anabolika?

- Myostatin oder Activin- Antagonisten?

- Training

- Ernährung

- Kombinationen

- Outcomes geriatrisch: Stürze, Funktion

Zusammenfassung

- Altersbedingter Verlust der Muskulatur

- Mitochondriale Dysfunktion und Myostatin

- Prävalenz in der Schweiz rund 27%

- Sarkopenie = bad outcomes

- Assessment: Kraft, Masse, Funktion, Gang

- Bettruhe und Medikamente verstärken die Problematik

Aktueller Stand

- Im Gegensatz zur Onkologie no "magic bullet"
- Interventionen
  – Mobilität fördern Medis reduzieren
  – Training und Ernährung
- Use it or loose it!