Tauchen mit Übergewicht (Adipositas)

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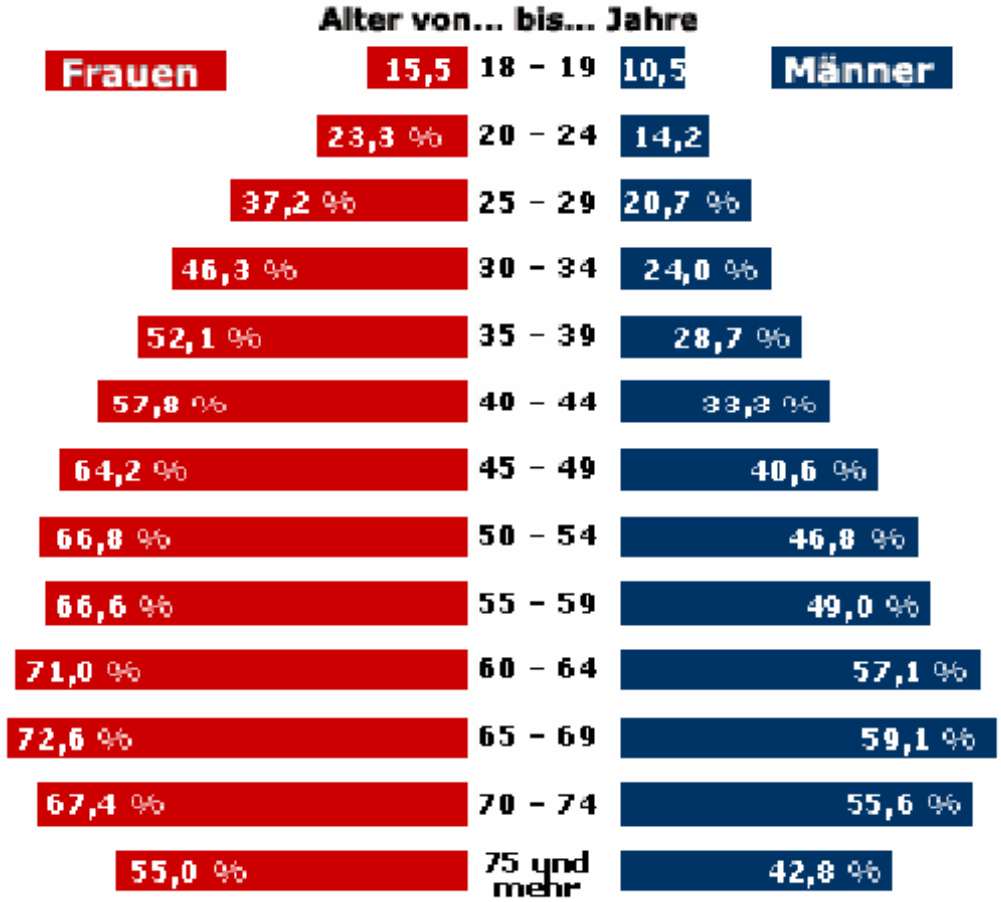
Adipositas - Einteilung

Gewichtsklasse	BMI [kg/m^2]	Risiko Begleiterkrankungen
Untergewicht	< 18,5	niedrig
Normalgewicht	18,5 - 24,9	durchschnittlich
Übergewicht	> 25,0	
Präadipositas	25 - 29,9	gering erhöht
Adipositas Grad I	30 - 34,9	erhöht
Adipositas Grad II	35 - 39,9	hoch
Adipositas Grad III	> 40	sehr hoch

Quelle: WHO. Obesity: preventing and managing the global epidemic. WHO Technical Report Series 894, Genf 2000

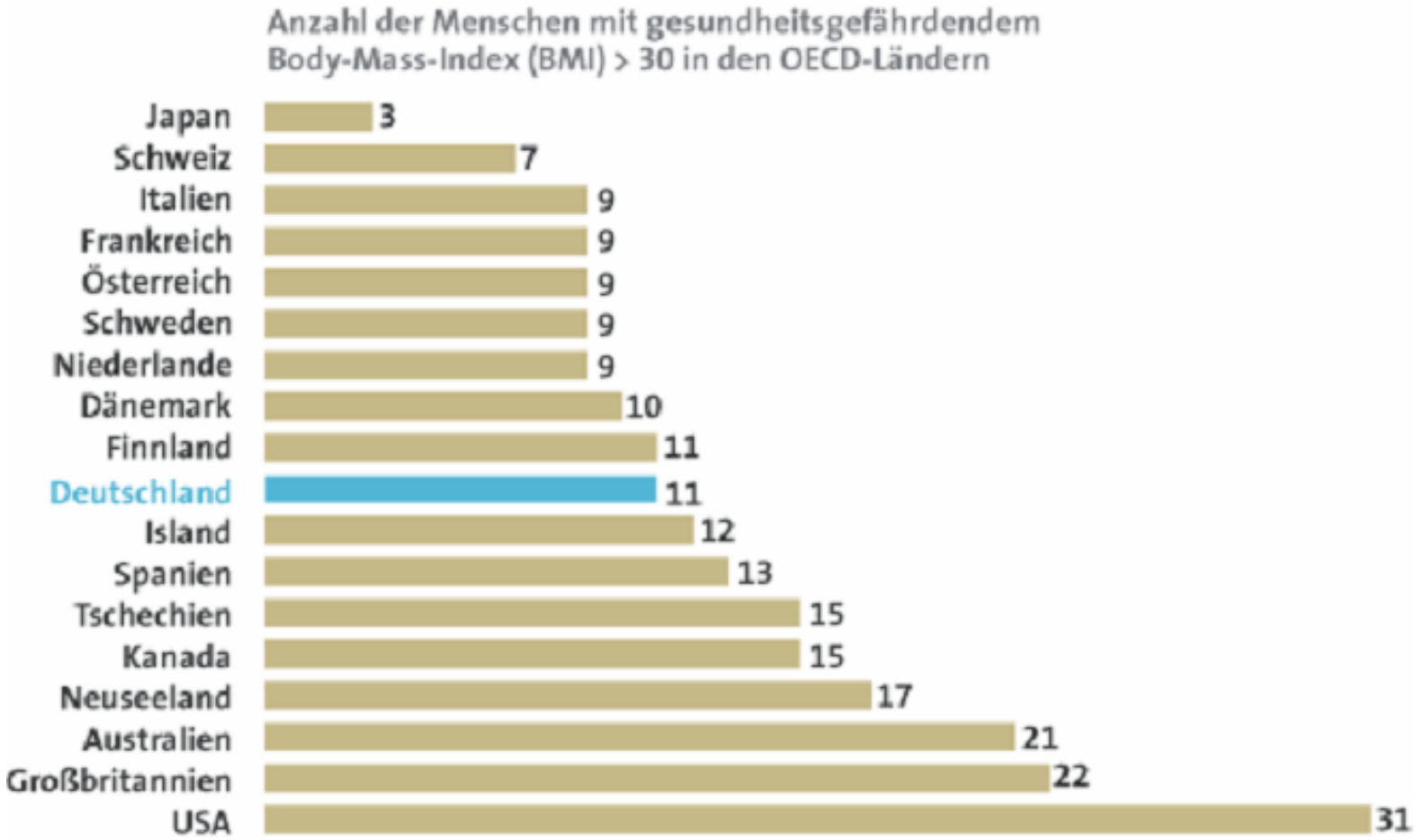
Adipositas - Epidemiologie



BMI > 25 in BRD

Statistisches Bundesamt BRD, Stand 2002

Adipositas - Epidemiologie

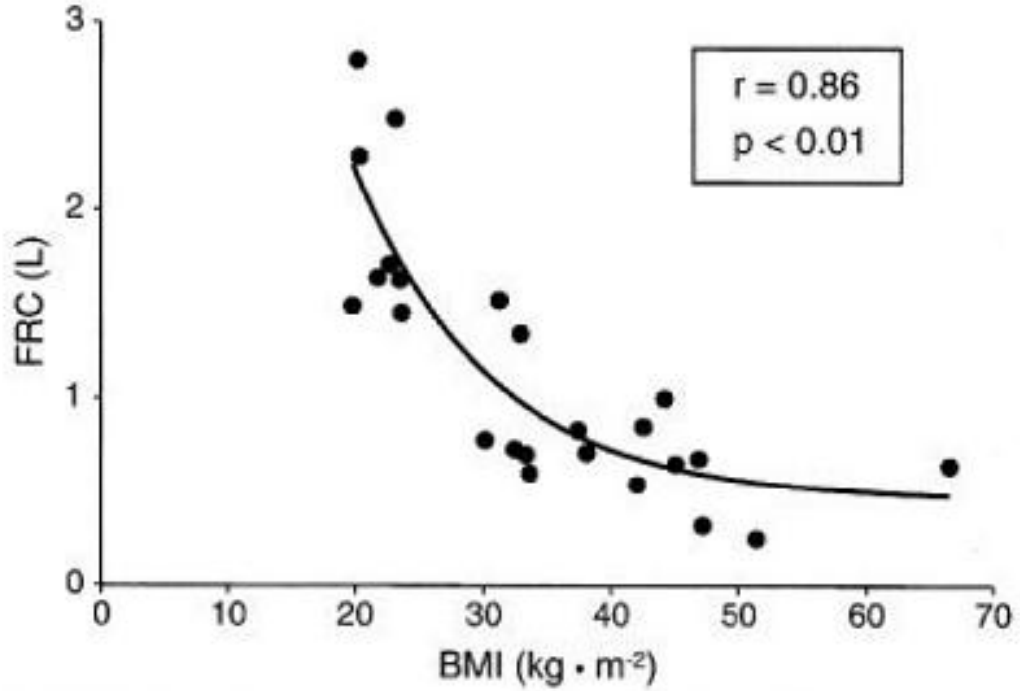


Begleiterkrankungen bei Adipositas

Herz-Kreislauf-System	• koronare Herzkrankheit (3x) • Myocardinfarkt (1,5 x) • Herzinsuffizienz, Hypertrophie (6x) • arterielle Hypertonie (2x) • Lungenembolie (3,5)
Gehirn	• Apoplex (2x)
Metabolisches Syndrom	• Diabetes mellitus (12 x) • Hyperurikämie
Atmung	• restriktive Ventilationsstörung (FRC, VC) • Schlaf-Apnoe-Syndrom (30 x)
Gastrointestinaltrakt	• Cholezystolithiasis • Fettleber
Bewegungsapparat	• Coxarthrose, Gonarthrose
Tumoren	• Uterus, Prostata, Mamma, Galle

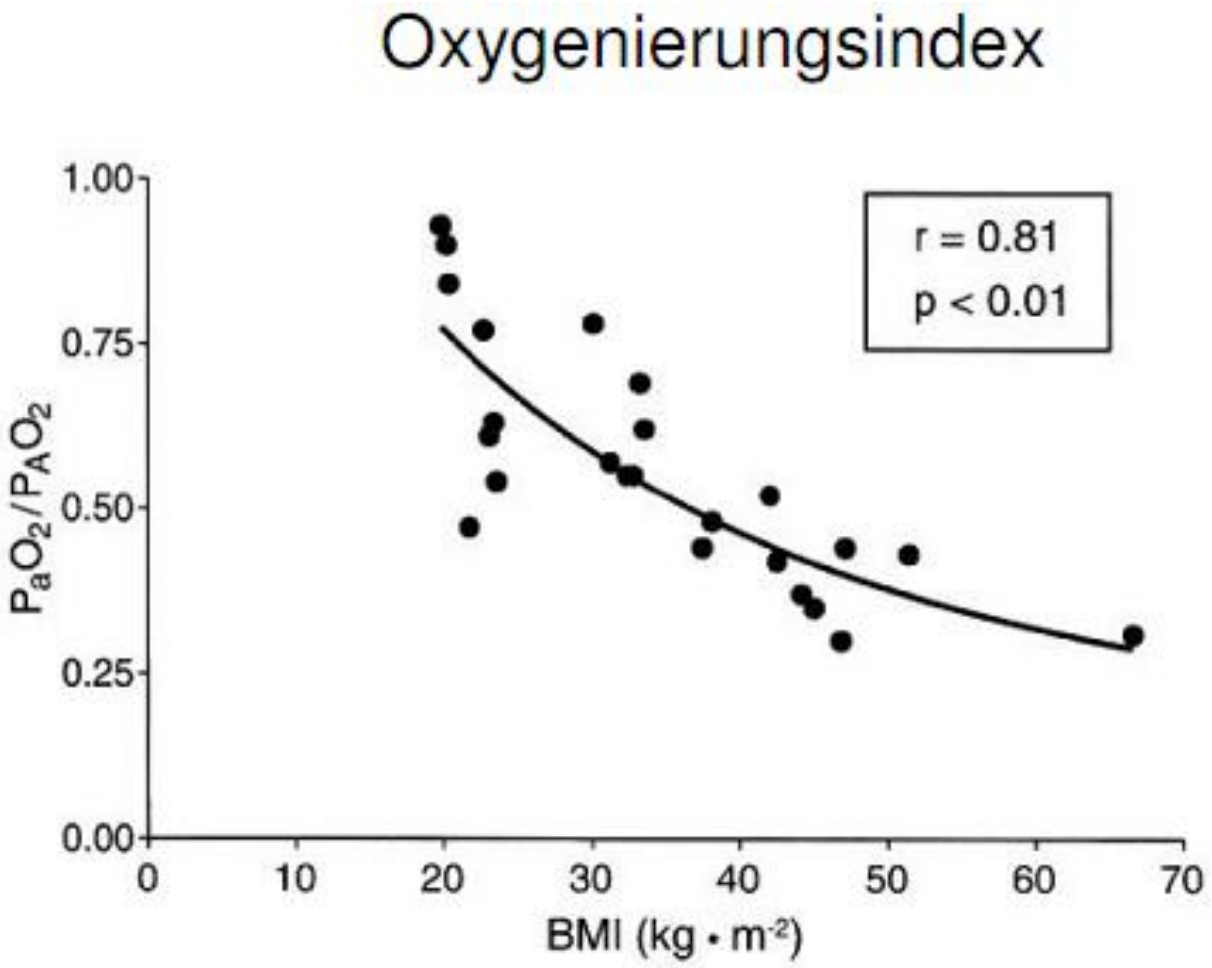
Lunge: Besonderheiten bei Adipösen

Funktionelle Residualkapazität



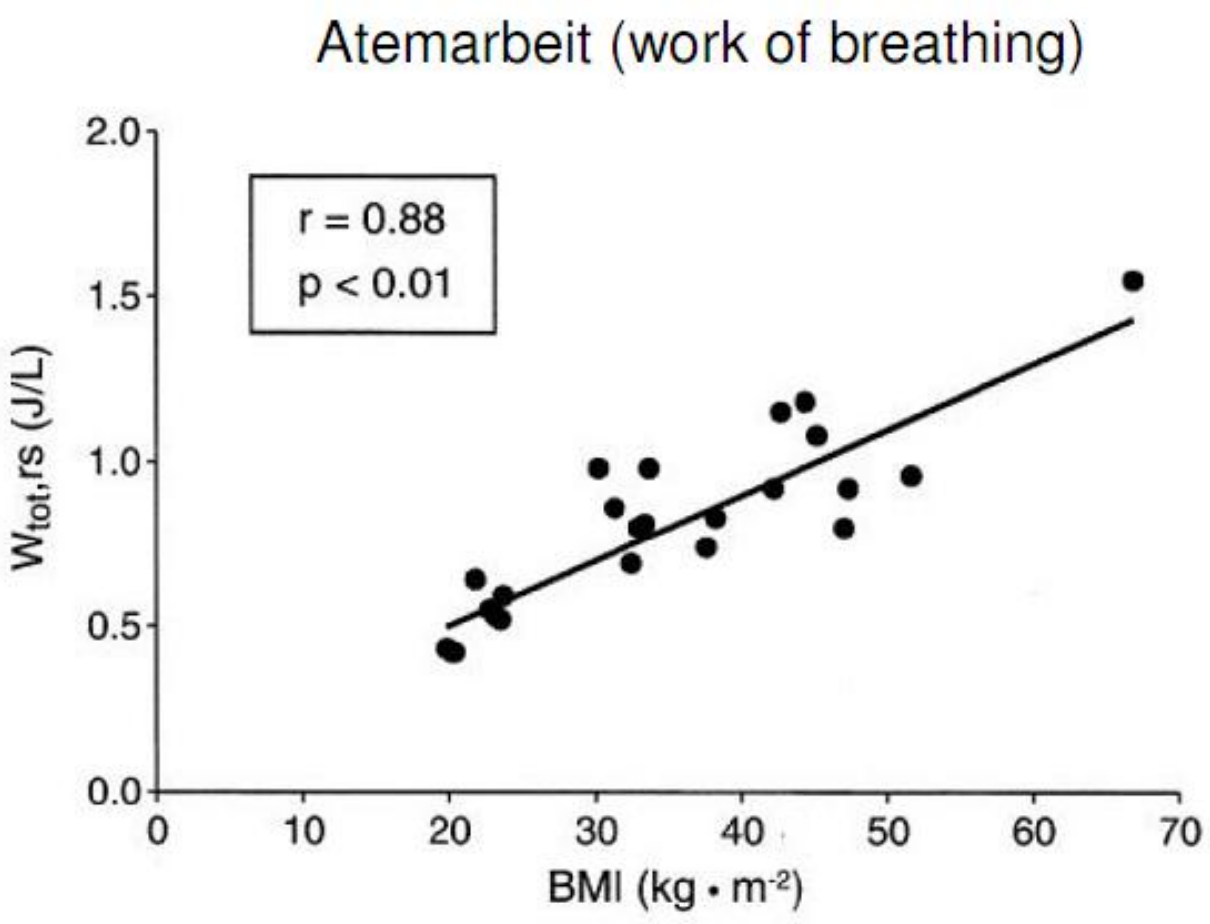
Anesth Analg 1998;87:654-60)

Lunge: Besonderheiten bei Adipösen



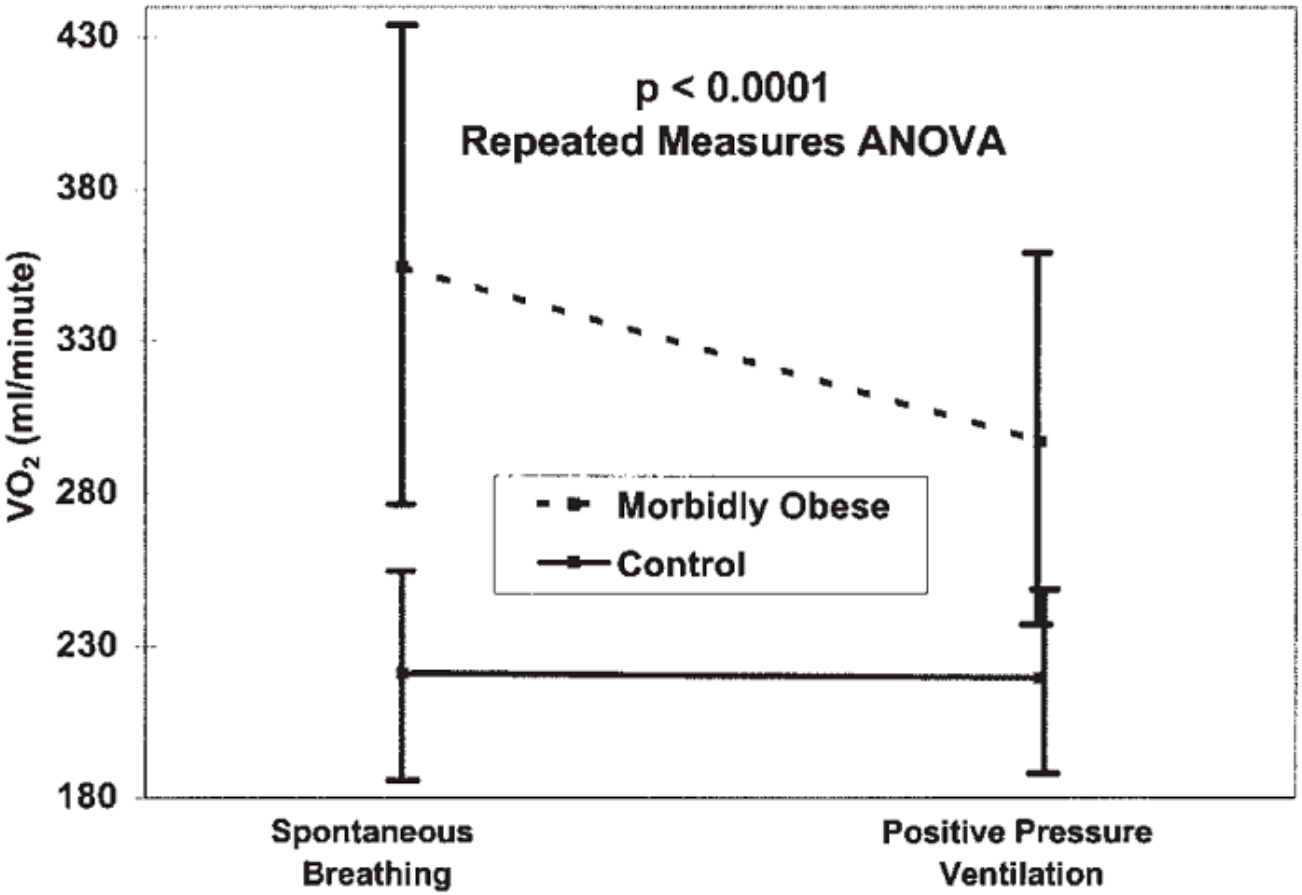
Anesth Analg 1998;87:654-60)

Lunge: Besonderheiten bei Adipösen



Anesth Analg 1998;87:654-60)

Lunge: Besonderheiten bei Adipösen
Cost of Breathing ($V_{O2, RESP}$) in Ruhe



AM J RESPIR CRIT CARE MED 1999;160:883–886.

Und was bedeutet das für‘s Tauchen???

Einflussfaktoren auf Blasenbildung

- Int J Sports Med. 1999 Aug;20(6):410-4.
- **Circulating venous bubbles in recreational diving: relationships with age, weight, maximal oxygen uptake and body fat percentage.**
- Carturan D, Boussuges A, Burnet H, Fondarai J, Vanuxem P, Gardette B.
- Decompression sickness (DCS) is recognized as a multifactorial phenomenon depending on several individual factors, such as age, adiposity, and level of fitness. The detection of circulating venous bubbles is considered as a useful index for the safety of a decompression, because of the relationship between bubbles and DCS probability. The aim of this work was to study the effects of individual variables which can be assessed non invasively, on the grades of bubbles detected 60 min, after diving by means of Doppler monitoring, in a sample of 40 male recreational scuba divers. The variables investigated were: age, weight, maximal oxygen uptake (VO2max) and percentage of body fat (%BF). Bubble signals were graded according to the code of Spencer. The relationships between the bubble grades (BG) and the variables investigated were studied using two methods: the differences between the average values of each variable at each BG were analyzed by the Scheffe test. Then we performed the non-parametric Spearman correlation analysis. Significant differences ($P < 0.05$) were found (Scheffe test) between average values of the variables at grade 0 and 3 (age: $P = 0.0323$; weight: $P = 0.0420$; VO2max: $P = 0.0484$), except for %BF ($P = 0.1697$). Relationships with $P < 0.01$ were found (Spearman correlation) between BG and the variables: age: $p = 0.486$, $P = 0.0024$; **weight**: $p = 0.463$, $P = 0.0039$; VO2max: $p = -0.481$, $P = 0.0027$**; except for %BF**: $p = 0.362$, $P = 0.0237$. This work showed that bubble production after hyperbaric exposures depends on several individual factors. The effects of age, weight and VO2max are more significant than the effect of %BF. We concluded that to take into account such variables in decompression tables and diving computer programs should allow to adapt the decompression procedures to individual risk factors and reduce the DCS probability.

Blasenbildung bei US-Militärtauchern

Dunford, RG; Denoble, PJ; Vann, RD; Shannon, JS; Pollock, NW; Howle, LE

accepted as significant. RESULTS: There were 861 incidents of HBG (39% of exposures). Helium was more likely to produce HBG (odds ratio [OR]=1.9; 95% confidence interval [CI] 1.6-2.4). When age was dichotomized at the median (27 years; range 20-46) older divers had more HBG (OR=1.5; 95% CI 1.2–1.8) as did divers with BMI scores above the median (24.5 kg/m2; range 20.3-32.4) (OR=2.1 95% CI 1.7–2.5). CONCLUSIONS: There were significantly more HBG with helium-oxygen than with nitrogen-oxygen, and the HBG incidence increased with age and BMI.

Abstract of the Undersea & Hyperbaric Medical Society 2008 Annual Scientific Meeting June 26-28, 2008 Salt Lake City Marriott Downtown, Salt Lake City, Utah.

Viel Körperfett → viele Blasen

- J Appl Physiol. 2002 Oct;93(4):1349-56.
- **Ascent rate, age, maximal oxygen uptake, adiposity, and circulating venous bubbles after diving.**
- Carturan D, Boussuges A, Vanuxem P, Bar-Hen A, Burnet H, Gardette B.

Table 3. *Parameter estimates of multinomial log-linear model: main effects model*

Grade	Intercept	Age	$\dot{V}O_2$	PBF	Ascent Rate
		Coefficients			
1	−3.992	0.069	0.005	0.029	−0.277
2	−5.401	0.093	−0.022	0.095	−0.648
3	−4.319	0.134	−0.073	0.080	−0.877
4	−38.842	0.228	0.146	0.823	−5.458
		Standard errors			
1	2.718	0.039	0.038	0.078	0.324
2	3.606	0.048	0.045	0.103	0.397
3	3.229	0.046	0.039	0.092	0.356
4	13.504	0.203	0.201	0.674	14.899
Residual deviance	186.00				
AIC	226.00				

A log-linear model is fitted, with coefficients zero for the first class. $\dot{V}O_2$, O_2 uptake; AIC, Akaike Information Criterion.

Viel Körperfett → viele Blasen

- J Appl Physiol. 2002 Oct;93(4):1349-56.
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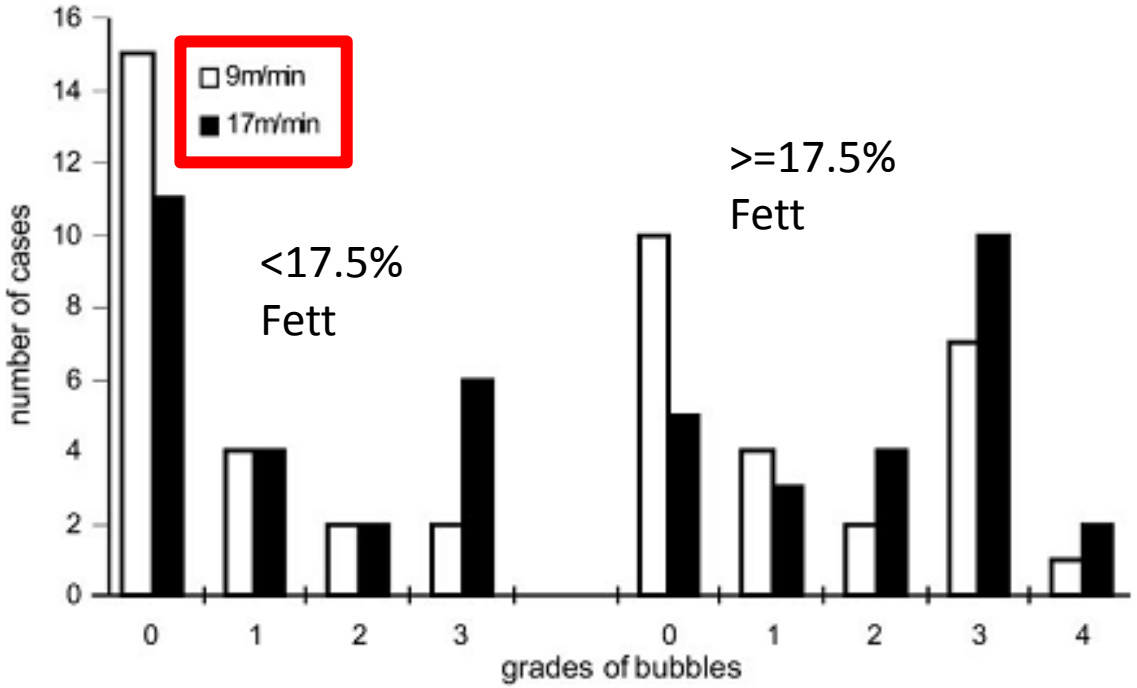
Fig. 4. Grades of bubbles according to percent body fat (PBF) and ascent rate. *Left*: PBF <17.5%; *right*: PBF ≥17.5%. Higher grades of bubbles are associated with higher PBF and faster ascent.



„Dicke Militärtaucher“

Undersea Biomed Res. 1984 Dec;11(4):395-406.

Health risk factors for the development of decompression sickness among U.S. Navy divers.

Dembert ML, Jekel JF, Mooney LW.

Abstract

The relationship between the health status and physical characteristics of 185 U.S. Navy divers and their risk for experiencing decompression sickness was examined utilizing historical cohort design. Data on multiphasic medical examinations performed on these men between 1972-1978 were obtained. Cases of decompression sickness before and after examination were identified. Divers who did experience decompression sickness either before or after examination had significantly higher measures of skinfold thickness and weight when compared to those who remained free of decompression sickness. Those divers in the highest quartile of each of three significant skinfold thicknesses measured had risks for decompression sickness that were generally 9 to 10 times as great as those calculated for the combined lower 3 quartiles and 5 to 6 times as great as the average crude risk calculated for all Navy divers over the past 5 yr. These findings suggest that obesity may be a contributory factor to the occurrence of decompression sickness.

DAN 2008: Tödliche Unfälle

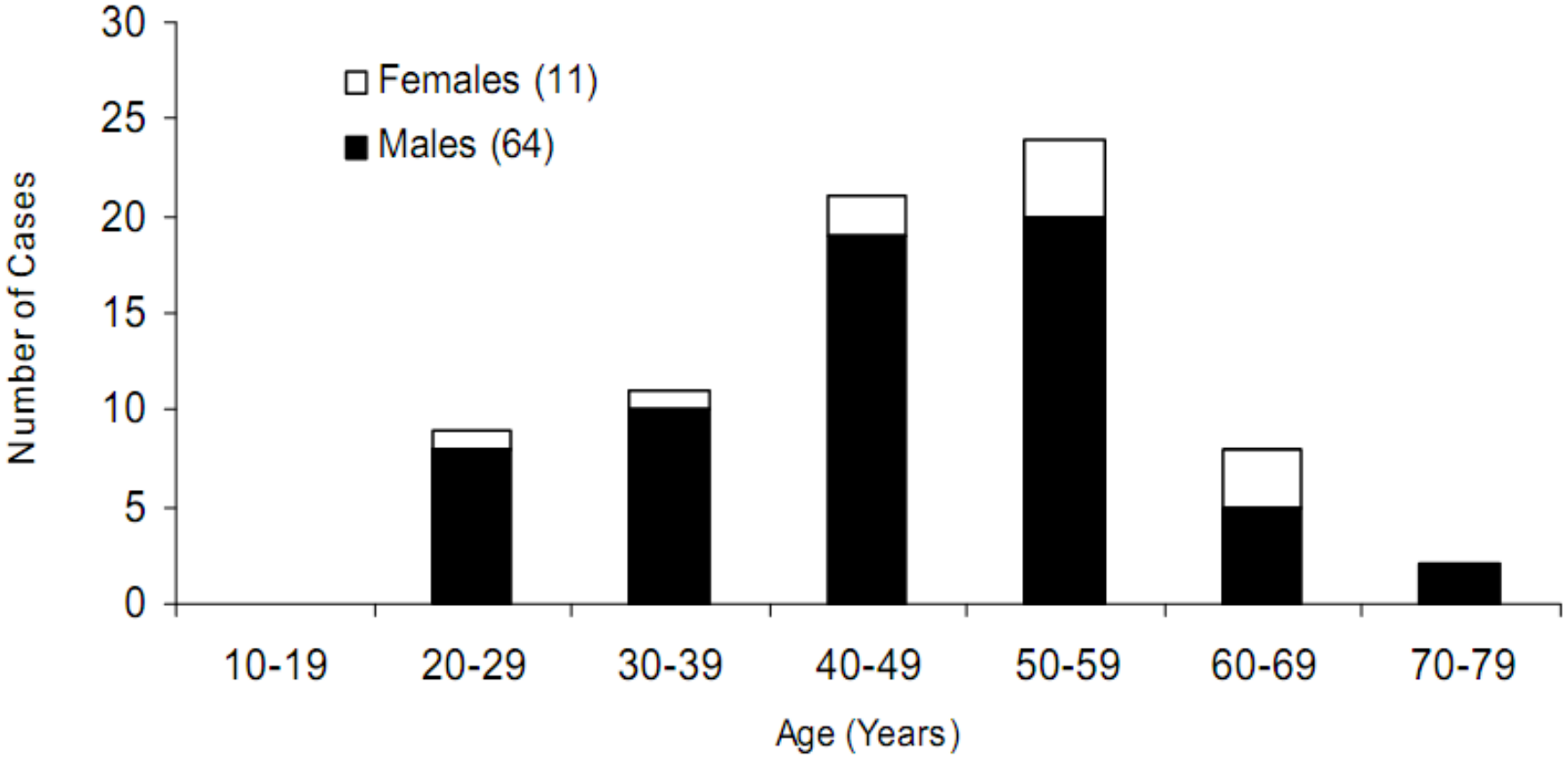


Figure 4.3-1 Distribution of fatalities by age and gender

DAN 2008: Tödliche Unfälle

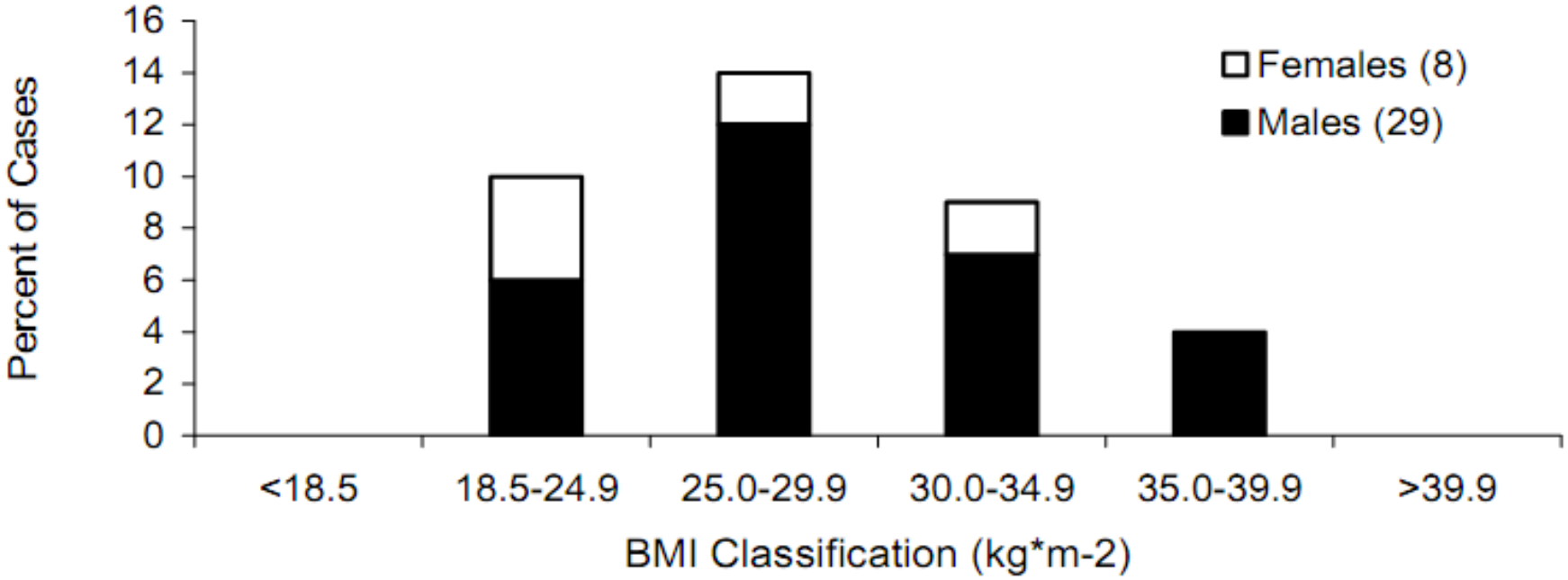


Figure 4.3-2. Classification of fatalities by BMI (n=37)

DAN 2008: Tödliche Unfälle

Figure 4.5.2-1. Cause of death (n=58)

DAN 2008: Tödliche Unfälle

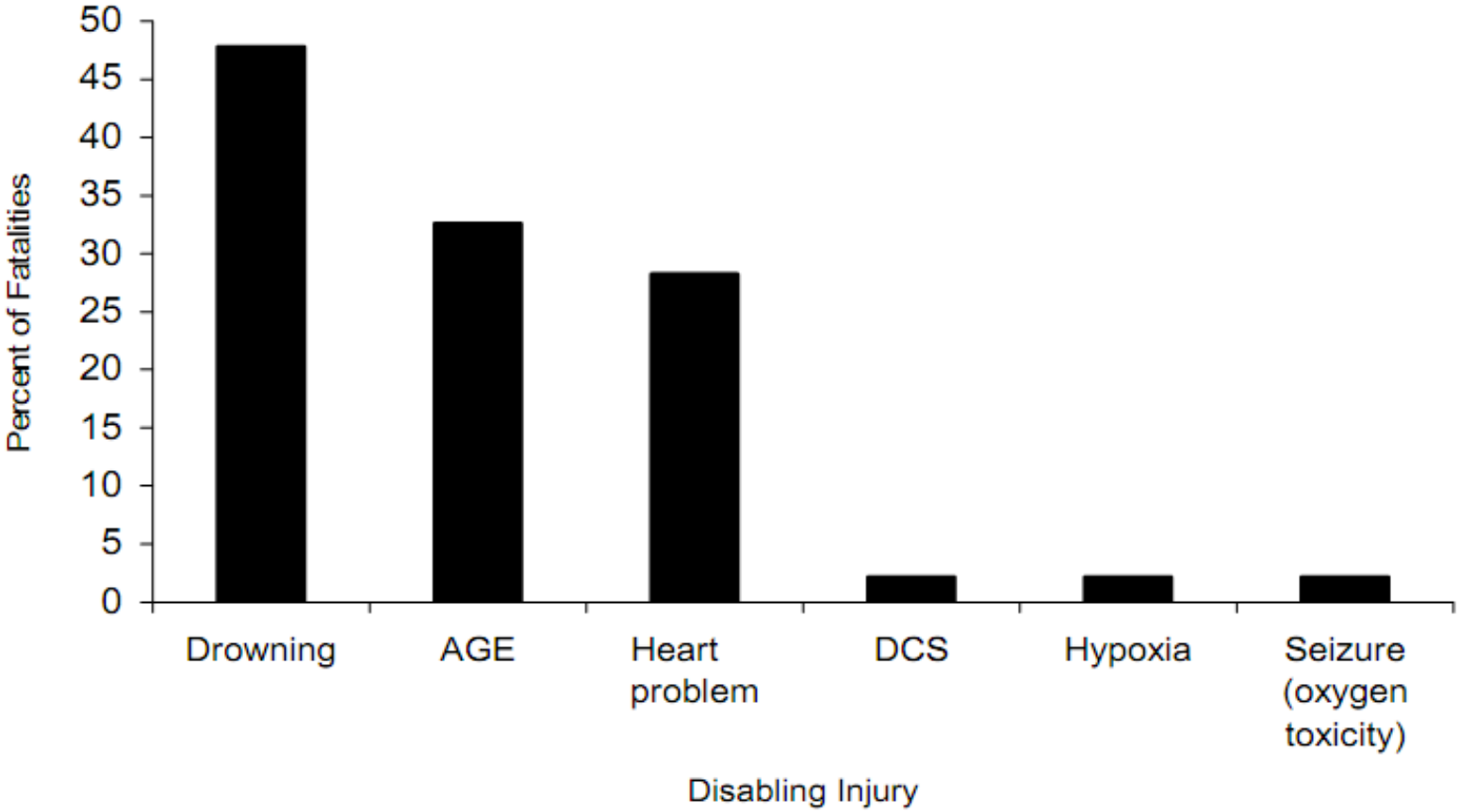


Figure 4.5.3-1. The distribution of the disabling injuries (n=46)

Zur Erinnerung: Begleiterkrankungen

Herz-Kreislauf-System	• koronare Herzkrankheit (3x) • Myocardinfarkt (1,5 x) • Herzinsuffizienz, Hypertrophie (6x) • arterielle Hypertonie (2x) • Lungenembolie (3,5)
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Rettungstaucher: G31

2.1 Kriterien

2.1.1 Dauernde gesundheitliche Bedenken

Erstuntersuchung	Nachuntersuchung

Personen mit

- allgemeiner Körperschwäche, reduziertem Ernährungs- und Kräftezustand
- Übergewicht von mehr als 30% n. Broca (Körpergröße in cm – 100 = kg Sollgewicht) oder vergleichbare andere Indizes (z. B. BMI > 30)
- Bewusstseins- oder Gleichgewichtsstörungen sowie Anfallsleiden jeglicher Ursache
- Erkrankungen oder Schäden des zentralen oder peripheren Nervensystems mit wesentlichen Funktionsstörungen und deren Folgezustände, funktionellen Störungen nach Schädel- oder Hirnverletzungen, Hirndurchblutungsstörungen

Rettungstaucher: G31

- Belastungs-EKG verbindlich vorgeschrieben
- Erforderliche Leistung abhängig vom Gewicht
- Je schwerer, desto mehr Leistung gefordert
- Bei Durchführung gem. G31-Vorgaben dürften zahlreiche adipöse Taucher nicht tauchtauglich sein

Fragen ???