The *influence* of body fat on post-dive bubble formation in recreational divers measured with precordial Doppler monotoring

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Study question

Are the BF (body fat) –VGB (venous gas bubble) relation and the BF–DCS-risk association, as found previously in various studies, co-associations due to VO_{2max}–BF and age–BF correlations?

Material and methods

Age, VO_{2max} and BF are mutually interrelated; **the problem of multi-collinearity.**
Therefore, regular Pearson correlation coefficients are biased and MV-regression eq's need more maths.
Solution: calculate partial Pearson correlation coefficients, to compensate for "contamination". Calculate MV-regressions including VIF.

Precordial Doppler (KM) readings at 40 and 100 min, 20msw/40min 7min deco, 61 divers, large ranges of BF, age, VO_{2max}.

KM scores were transformed to logKISS and to log{#bubbles/cm^2} = logB (with KM-EB conversion). Independent test variables: BF, age, VO_{2max}.

Results

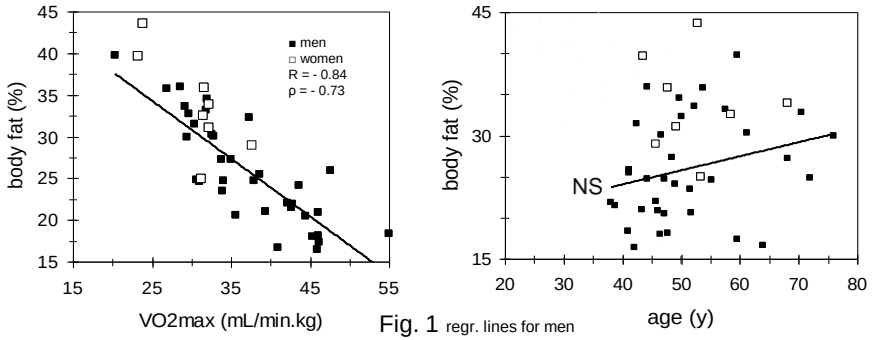

Fig. 1 regr. lines for men

	age	body fat	BMI	VO_{2max}
logB regular R	0.333* (0.017)	0.213 (0.13)	0.091 (0.45)	-0.384** (0.0051)
logB partial ρ	*0.15* (0.31)	*-0.138* (0.35)	*-0.037* (0.80)	*-0.296** (0.039)

P-values in parentheses. * $P<0.05$, ** $P<0.01$

model #	Model description	*P*-value of coefficient	VIF
1	logB(constant,A)	0.004*	
2	logB(constant,Vm)	0.001**	
3	logB(constant,BF)	0.072	
4	logB(constant,A,Vm,BF)	0.19	1.3
		0.013*	4.2
		0.16	3.7
5	logB(constant,A,Vm)	0.080	1.2
		0.049*	
6	logB(constant,A,Vm) Carturan et al. 2002	0.035*	1.3
		0.050*	

* P < 0.05, ** P < 0.01 Vm, VO_{2max}; VIF variance inflation factor

VIF is a measure of variance increase of a regression coeff. due to (multi-)collinearity.

Each of the 3 MV-regressions of demographic variables yields a VIF= SS_{tot} /SS_{reg} (here 1 or 2-D). VIF>2 is poor too unacceptable.

Model 3&4 rejected due to (too) high P('s) and VIF's

Model 1, 2, 5 & 6 accepted: age, VO_{2max} contribute to VGB.

Model 5&6 combined (averaged):

$\log B(A,Vm) = -1.6 + 0.033Age - 0.038\ VO_{2max}$

$\#bubbles/cm^2 = 0.025 \times 10^{0.033Age}/10^{0.038VO2max}$

With $pDCS = 6.0 \times 10^{0.33logB}$ (Schellart & Sterk, UHM 2012:39;577-88) Fig. 2 is obtained.

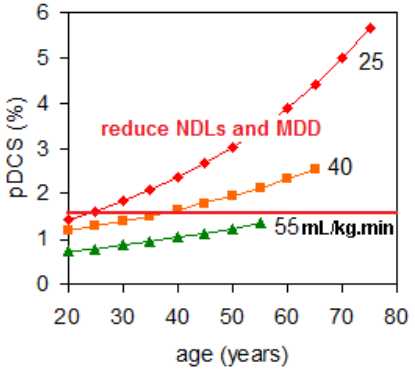

Fig. 2

CONCLUSIONS/RECOMMENDATIONS

1 BF appears not to influence VGB scores.

2 Age and VO_{2max} do.

3 VO_{2max} should be used for exam of recreational divers; BF is only a clue.

4 40 mL and 25 mL O_2 mL/kg.min seem to be minimal values for professional and recreational divers respectively.

Schellart et al., ASEM 2012:83;951-7.