Which amount of BMI-SDS reduction is necessary to improve cardiovascular risk factors in overweight children?

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Rationale and Study Design:

Objective: To determine the BMI-SDS reduction to improve cardiovascular risk factors (CRFs) in overweight or obese children.

Design: Prospective observation study.

Patients: 1388 overweight or obese children (mean BMI 27.9±0.1, mean age 11.4±0.1years, 43.8% male, 45.5% prepubertal).

Intervention: 1-year lifestyle intervention.

Used Percentiles: IOTF (Cole TJ, Lobstein T: Extended international (IOTF) body mass index cut-offs for thinness, overweight and obesity. Pediatr Obes 2012;7:284-)

Statistic approach:

Multivariable regression analysis set up for all CRFs, respectively, with change in CRF as the dependent variable and CRF at baseline as well as BMI-SDS at baseline as the independent variables. Moreover, we adjusted for age at baseline, sex, baseline pubertal stage and change in pubertal stage.

In case of significant correlation between baseline CRF and baseline BMI-SDS, we included an interaction term between both variables in the model. BMI-SDS decrease was included continuously as well as categorized into the model.

Adjusted changes of cardiovascular risk factors per decrease of 0.1 BMI-SDS

	entire study group	prepubertal children	pubertal children	overweight children	Obese children	extremely obese children	children with abnormal CRFs
Δsystolic blood pressure [mmHg]	-1.04 (0.09)***	-1.10 (0.16)**	-0.90 (0.12)**	-1.22 (0.30)***	-0.77 (0.15)***	-0.81 (0.11)***	-0.84 (0.23)***
Δdiastolic blood pressure [mmHg]	-0.79 (0.07)***	-0.76 (0.13)**	-0.66 (0.09)**	-0.52 (0.22)*	-0.79 (0.12)***	-0.57 (0.81)***	-0.56 (0.22)**
ΔLDL cholesterol [mg/dl]	-0.70 (0.17)***	-0.36 (0.30)	-0.75 (0.21)**	-0.51 (0.46)	-0.66 (0.31)*	-0.56 (0.19)**	-0.28 (0.76)
ΔHDL cholesterol [mg/dl]	+0.21 (0.08)***	+0.32 (0.13)*	+0.20 (0.11)*	+0.14 (0.21)	+0.12 (0.16)	+0.20 (0.09)*	+0.44 (0.14)**
Δtriglycerides [mg/dl]	-2.3 (0.4)***	-2.4 (0.7)***	-2.1 (0.05)***	-0.6 (0.8)	-2.4 (0.7)***	-2.0 (0.4)***	-6.9 (2.5)**
Δfasting glucose [mg/dl]	-0.24 (0.07)***	-0.25 (0.09)*	-0.17 (0.10)	-0.26 (0.17)	-0.25 (0.10)**	-0.15 (0.08)*	&
ΔHOMA	-0.16 (0.02)***	-0.11 (0.03)**	-0.20 (0.03)***	-0.04 (0.05)	-0.13 (0.03)***	-0.18 (0.03)***	-0.36 (0.17)*
Δtriglycerid./ HDL chol.	-0.05 (0.01)***	-0.07 (0.02)**	-0.05 (0.02)**	-0.01 (0.03)	-0.05 (0.02)*	-0.05 (0.01)**	-

*p<0.05; **:p<0.01;****:p<0.001

Unadjusted changes of CRFs during a 1-year lifestyle intervention separated to degree of BMI-SDS reduction in overweight children with abnormal CRFs at baseline

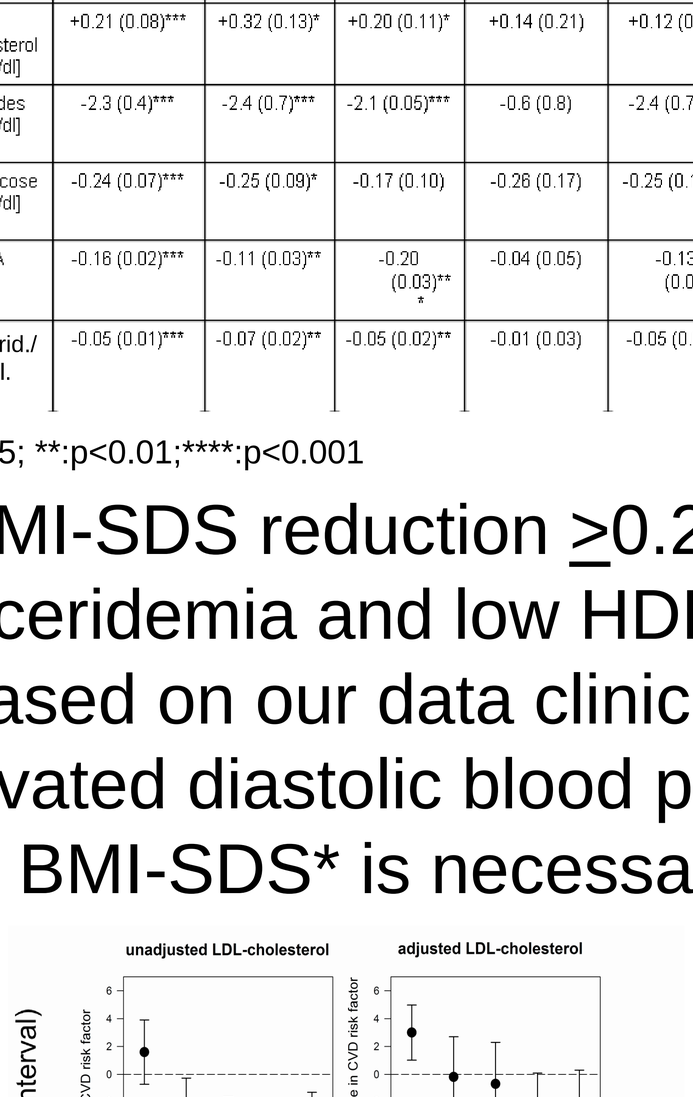
Δ BMI-SDS	Decrease <0.125	Decrease 0.125-<0.25	Decrease 0.25-0.5	Decrease >0.5
Δ Systolic BP [mmHg] n=	-7 ±2*** 63	-16 ±2*** 66	-16 ±2*** 86	-18 ±2*** 70
Δ Diastolic BP [mmHg] n=	-5 ±2** 63	-5 ±2* 66	-10 ±2*** 86	-12 ±1*** 70
Δ LDL-chol. [mg/dl] n=	-19 ±4*** 37	-22 ±7** 38	-24 ±4*** 43	-20 ±5*** 34
Δ HDL-chol. [mg/dl] n=	n.s. 89	+3 ±1*** 70	+4 ±1*** 100	+6 ±1*** 67
Δ Triglycerides [mg/dl] n=	n.s. 61	-39 ±10*** 40	-59 ±10*** 59	-85 ±10*** 33
Δ HOMA n=	n.s. 84	-0.7 ±0.3** 87	-1.2 ±0.2*** 105	-1.6 ±0.3*** 70

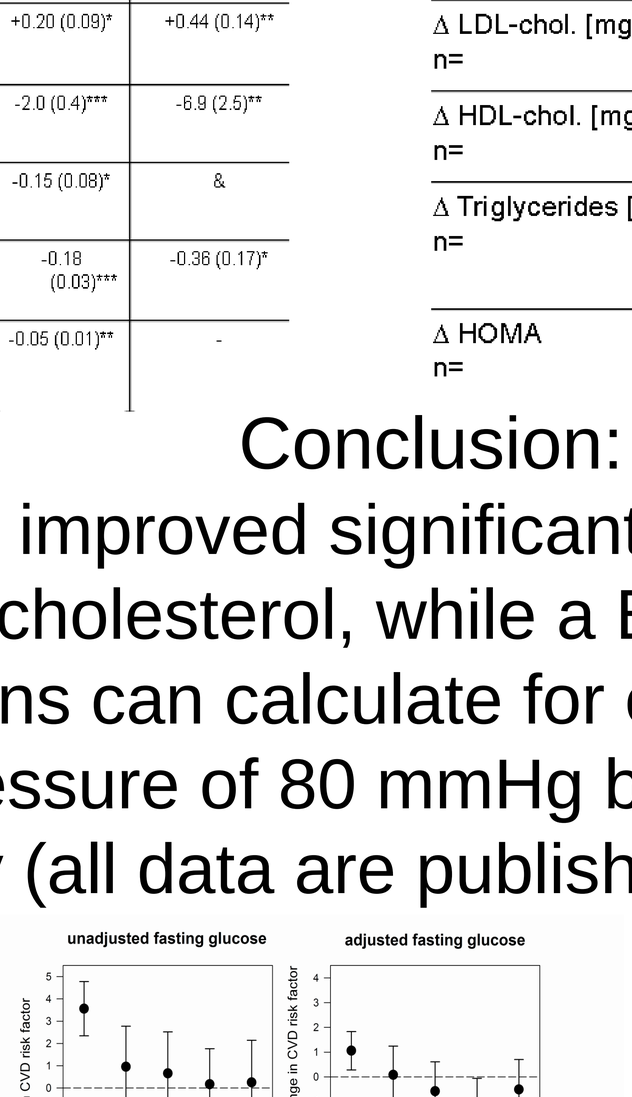
BP: blood pressure; *p<0.05; **:p<0.01;****:p<0.001

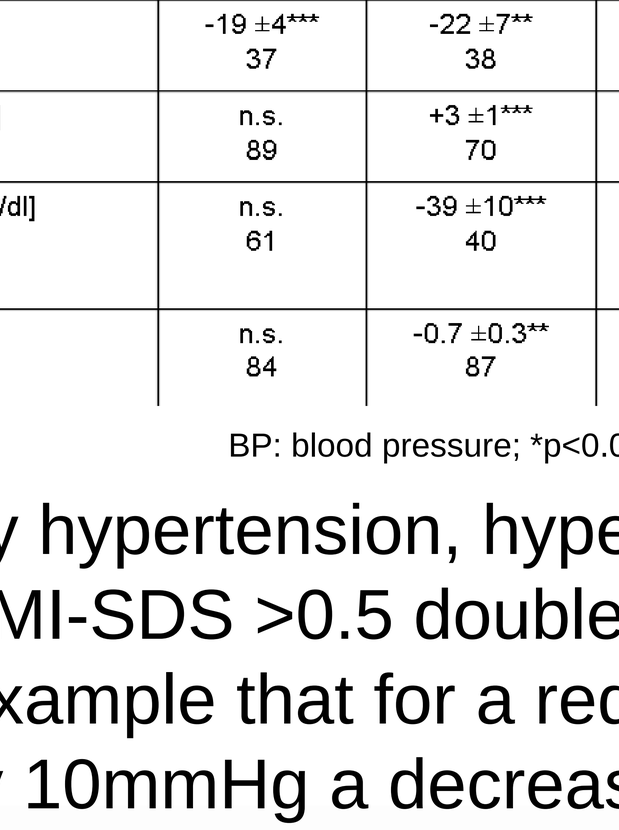
Conclusion:

- BMI-SDS reduction ≥0.25 improved significantly hypertension, hypertri-glyceridemia and low HDL-cholesterol, while a BMI-SDS >0.5 doubled the effect.
- based on our data clinicians can calculate for example that for a reduction of an elevated diastolic blood pressure of 80 mmHg by 10mmHg a decrease of 0.25-0.5 BMI-SDS* is necessary (all data are published in JCEM 2016;10:jc20161885)

Unadjusted and adjusted changes of CRFs separated to degree of weight loss (data as mean 95% confidence interval)







•Based on the IOTF percentiles, a BMI-SDS reduction of ≥0.25 in one year is approximately a BMI reduction of 0.5 kg/m² in a 7 year old child and a BMI reduction of 1.0 kg/m² in a 13 year old adolescent. A BMI-SDS reduction of 0.5 represents approximately a weight loss of 5 kg in a male adolescent with 1 cm growth per year or a stable weight in children growing ≥ 5cm per year.

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