

The effect of demographic and lifestyle factors on one-year BMI increments in 776 Norwegian children aged 6-15 years

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Background:

There is limited information on the ability of demographic or lifestyle factors to predict short term changes in weight status during childhood.

Objective and hypotheses:

To study the effect of parental (educational level, BMI status and parents defining their children as overweight or obese - Parental perception) and childhood factors (eating habits, sedentary behaviour and physical activity), on one-year BMI increments by the use of BMI, BMI SDS and BMI SDS conditional gain.

Method:

Each of the three BMI measures (changes in BMI and BMI SDS, and BMI conditional gain) was analysed separately as a dependent variable with linear regression models, using data from the Bergen Growth Study 1. Adjusted regression models were estimated for each BMI measure separately, including all the statistically significant variables from the unadjusted models.

Results:

In the unadjusted models (Table 1), one-year changes in BMI were correlated to age, maternal BMI, parental perception, irregular meals and screen time. Changes in BMI SDS were correlated to age, BMI SDS at baseline, irregular meals and screen time. Changes in BMI SDS conditional gain were correlated to maternal BMI, parental perception and irregular meals.

In the adjusted model (Table 2) BMI increments were correlated to age, parental perception, irregular meals and screen time, BMI SDS increments to BMI SDS at baseline, parental perception, irregular meals and screen time and BMI SDS conditional gain to parental perception and irregular meals.

Table 1. Results from unadjusted linear regression analyses of three BMI measures on 18 personal and lifestyle factors for 776 children (379 boys) aged 6 to 15 years in the Bergen Growth Study in Norway (2003-2006)

Measures Lifestyle factors	BMI difference			BMI SDS			BMI conditional gain SDS		
	b	95% CI	p	b	95% CI	p	b	95% CI	p
N	774 (377 boys)			774 (377 boys)			769 (374 boys)		
Sex(boys/girls)	.097	(-.028, .222)	.130	.034	(-.016, .084)	.181	-.008	(-.135, .151)	.911
Age (years)	.053	(.029, .078)	<.001*	.015	(.005, .025)	.002*	-.005	(-.034, .023)	.707
BMI SDS at baseline	0.22	(-.039, .083)	.476	-.060	(-.083, -.036)	<.001*	.056	(-.014, .125)	.115
Parental education (low/high)	-.005	(-.136, .126)	.938	-.019	(-.071, .033)	.470	-.017	(-.166, .132)	.822
Mother's BMI	.023	(.005, .041)	.010*	.001	(-.006, .008)	.818	.026	(.005, .046)	.013*
Fathers' BMI	.002	(-.021, .025)	.865	-.008	(-.017, .001)	.095	.005	(-.021, .031)	.687
Parental perception weight child	.355	(.140, .570)	.001*	-.025	(-.111, .060)	.563	.312	(.067, .557)	.013*
Eating habits									
Irregular meals (yes/no)	.267	(.105, .429)	.001*	.084	(.020, .149)	.010*	.257	(.073, .442)	.006*
Fruit (7 levels)	-.034	(-.078, .010)	.129	-.010	(-.028, .008)	.266	-.014	(-.064, .037)	.597
Vegetables (7 levels)	-.009	(-.057, .039)	.720	-.003	(-.022, .016)	.762	-.005	(-.060, .049)	.852
Sweets (7 levels)	.069	(-.016, .155)	.113	.069	(-.016, .155)	.113	.034	(-.063, .132)	.486
Soda (7 levels)	.003	(-.058, .065)	.911	.001	(-.023, .025)	.941	-.035	(-.105, .034)	.320
Fastfood (7 levels)	.060	(-.033, .153)	.206	.020	(-.017, .057)	.283	.067	(-.039, .173)	.213
Sedentary behaviour									
Screen time (6 levels)	.148	(.072, .224)	<.001*	.037	(.007, .067)	.016*	.069	(-.018, .156)	.119
TV in bedroom (yes/no)	.079	(-.057, .214)	.255	.023	(-.030, .077)	.393	.076	(-.078, .230)	.332
Physical activity									
Phys. Activity (t/w)	-.004	(-.061, .052)	.885	.007	(-.016, .029)	.561	-.015	(-.079, .049)	.648
Phys. Activity (h/w)	-.012	(-.067, .043)	.670	-.001	(-.023, .021)	.948	-.018	(-.082, .045)	.568
Walk/bike to school (t/w)	.004	(-.025, .034)	.775	.004	(-.008, .016)	.510	.024	(-.010, .058)	.162

Abbreviations: BMI: body mass index; SDS: standard deviation score; b: estimated regression coefficient; CI: confidence interval; t/w: times per week; h/w: hours per week; bold*: ≤ 0.05.

Discussion:

Considerable differences were found between the measures of BMI increments. BMI is affected by age and BMI SDS is influenced by the regression to the mean. However, BMI SDS conditional gain takes into account sex and age and adjusts for the regression to the mean.

Parental perception, irregular meals and screentime are predictors of higher one-year BMI increments in children. There are no associations between BMI increments and physical activity, possibly because BMI is a poor measure of body composition. Parental education level is unrelated to BMI increments, possibly because an established childhood overweight development (the parents defining their child as overweight or obese) is very difficult to stop, even for resourceful families.

Conclusion:

Considerable differences were found between the measures of BMI increments.

BMI SDS conditional gain adjusts for age, sex and the regression towards the mean, and is therefore the preferred measure of BMI increments.

Parental perception of child as being overweight or obese, irregular meals and screen time can predict higher one year BMI increments in children aged 6 to 15 years.

Table 2. Results from fully adjusted regression analyses including step-down of three BMI measures on 18 personal and lifestyle factors for 776 children aged 6 to 15 years in the Bergen Growth Study in Norway (2003-2006)

Measures Lifestyle factors	BMI Difference		BMI Difference Step down		BMI SDS Difference		BMI SDS difference Step down		BMI Conditional Gain		BMI Conditional Gain Step down	
	b	95% CI	b	95% CI	b	95% CI	b	95% CI	b	95% CI	b	95% CI
Age (years)	.037	(.010, .064)*	0.38	(.012, .064)*	.007	(-.004, .018)	-.078	(-.105, -.051)*	-.024	(-.055, .008)		
BMI SDS at baseline	-.061	(-.134, .012)			-.085	(-.115, -.056)*			-.025	(-.111, .060)		
Mother's BMI	.019	(.000, .038)*			.006	(-.002, .013)			.020	(-.002, .042)		
Parent perception weight child	.440	(.194, .687)*	.365	(.150, .580)*	.108	(.009, .207)*	.097	(.001, .193)*	.322	(.033, .610)*	.310	(.064, .557)*
Eating habits												
Irregular meals (yes/no)	.142	(-.025, .308)	.199	(.037, .361)*	.060	(-.007, .127)	.087	(.023, .150)*	.200	(.004, .395)*	.248	(.063, .433)*
Sedentary behaviour												
Screen time (6 levels)	.102	(.021, .184)*	.091	(.011, .170)*	.029	(-.004, .062)	.032	(.001, .062)*	.072	(-.024, .167)		

Abbreviations: BMI: body mass index; SDS: standard deviation score; b: estimated regression coefficient; CI: confidence interval; *: ≤ 0.05.

