

PHYSICAL ACTIVITY, BODY COMPOSITION AND RESTING BRAIN ACTIVITY

Preliminary findings

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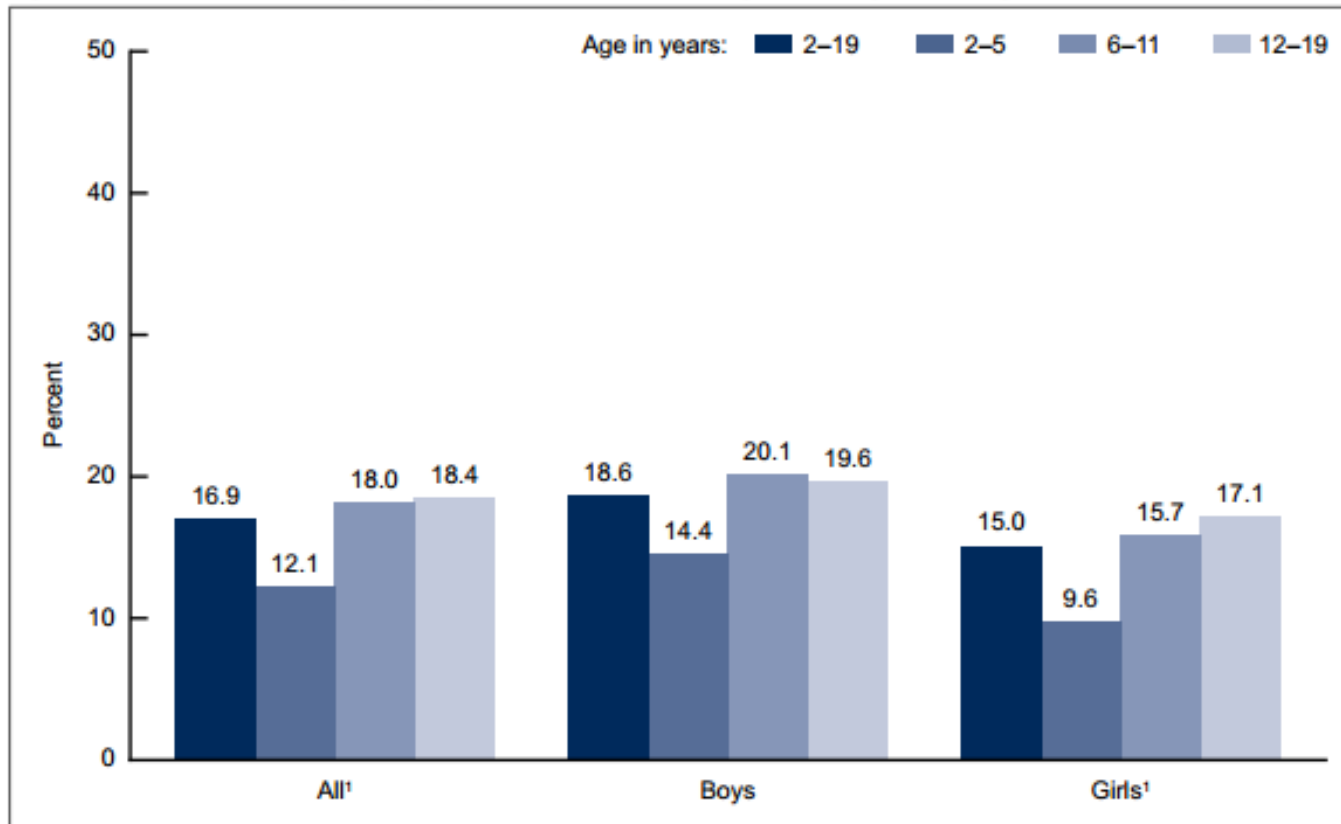
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OBESITY IN THE U.S.

- More than one-third of U.S. adults (35.7%) are obese.
- 16.9% of U.S. children and adolescents are obese.

Figure 2. Prevalence of obesity among children and adolescents aged 2–19, by sex and age: United States, 2009–2010



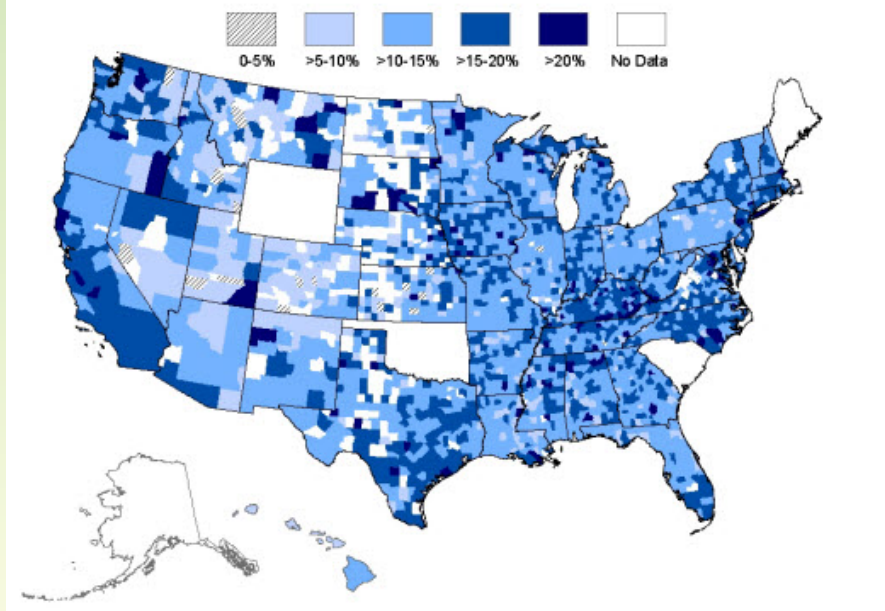
¹Significant increasing linear trend by age ($p < 0.005$).

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2009–2010.

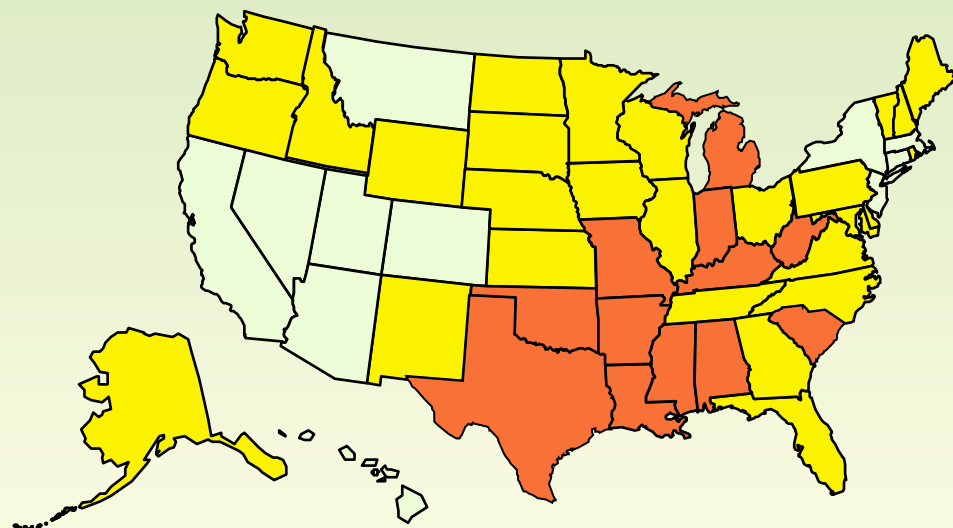
OBESITY IN TENNESSEE

- One-third adults (32.8%) are obese (3rd).
- 36.5% of children and adolescents are obese (4th).
- 13.8% of children 2 to 4 years of age are obese.

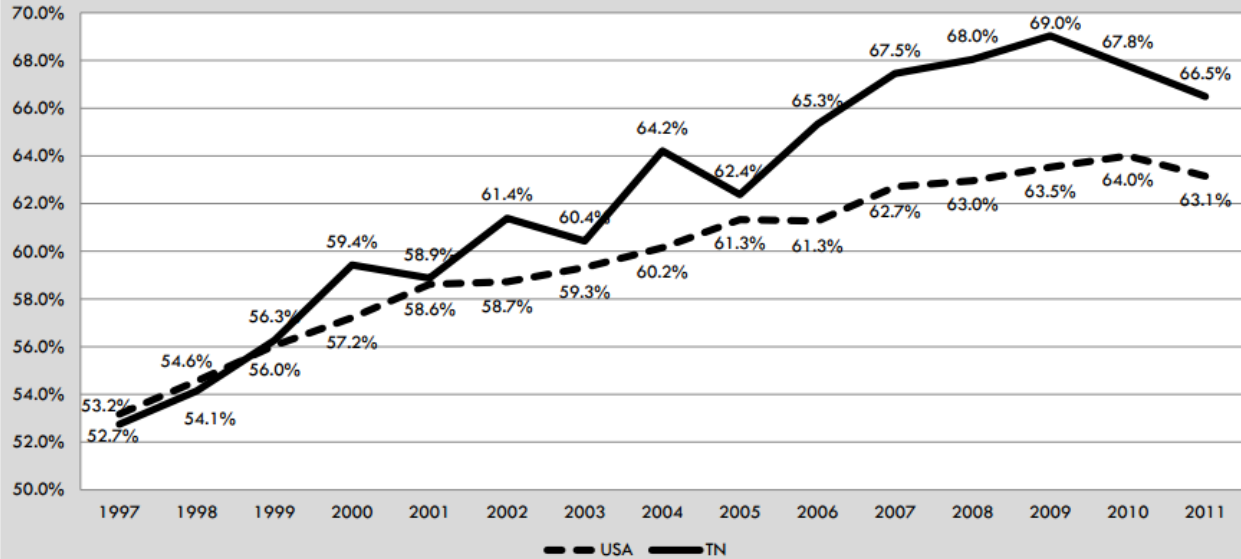
2009–2011 County Obesity Prevalence Among Low-Income Children Aged 2 to 4 Years



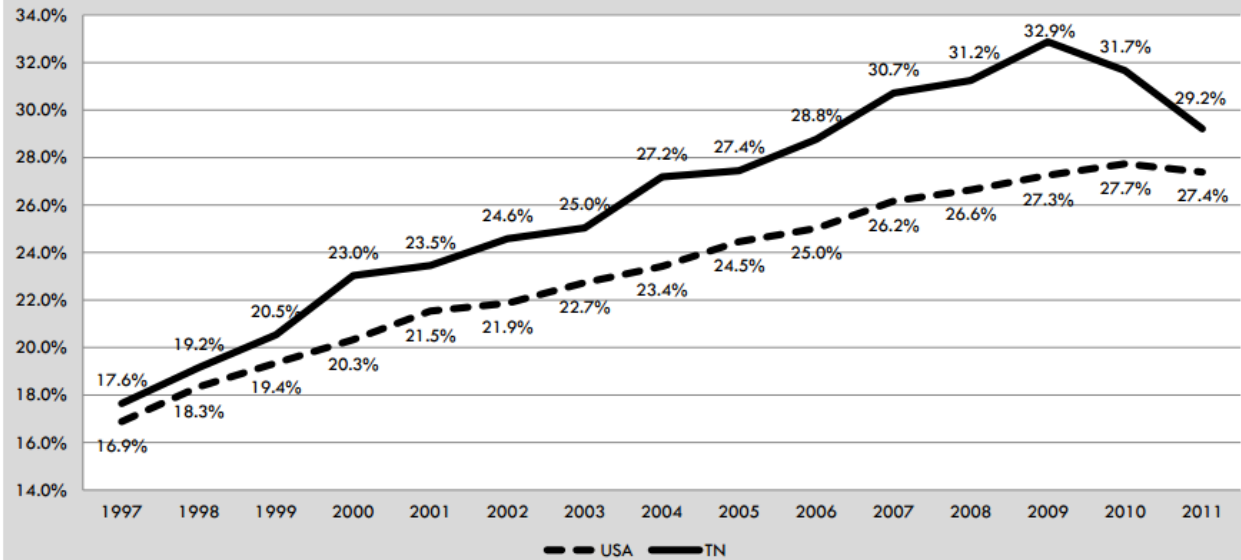
Prevalence* of Self-Reported Obesity Among U.S. Adults
BRFSS, 2011



Overweight Prevalence 1997-2011 US vs. TN



Obesity Prevalence 1997-2011 US vs. TN



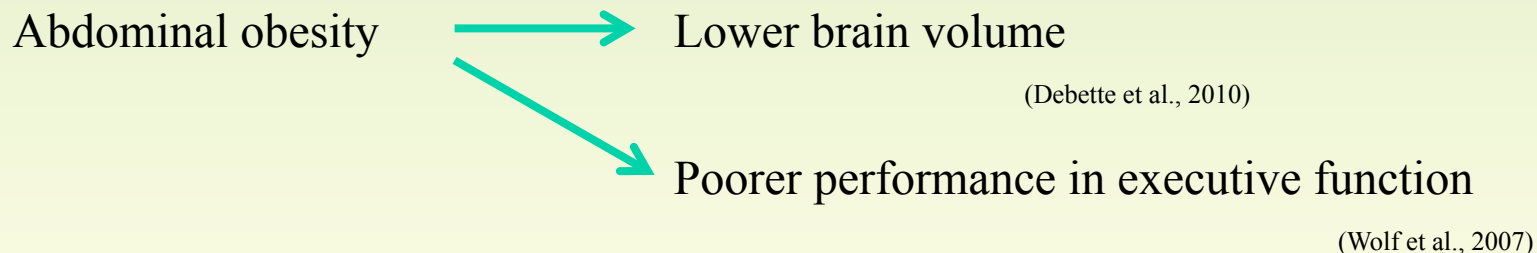
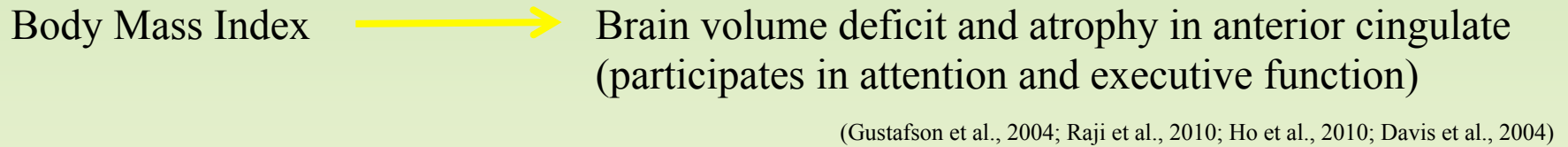
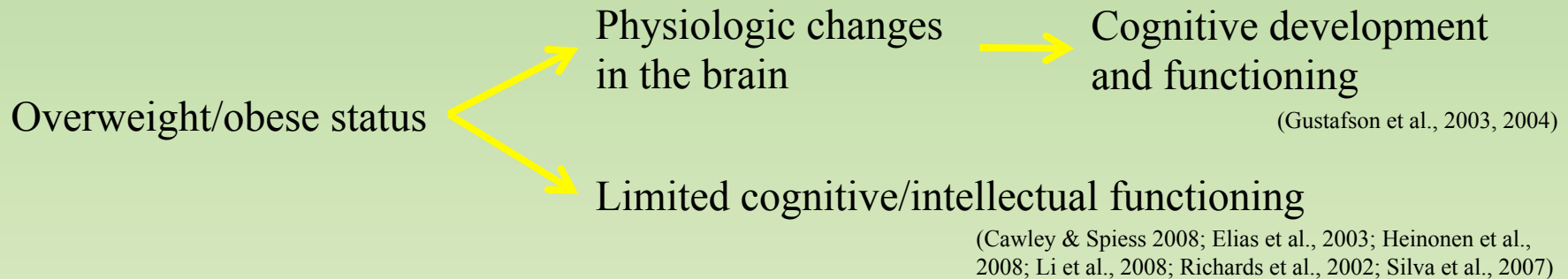
PHYSICAL ACTIVITY IN TENNESSEE AND THE U.S.

- **51.8%** of the adults are physically active in Tennessee (vs. 64.5%)
- **29.9%** of the adults are highly active in Tennessee (vs. 43.5%)
- 27.3% inactive (vs. 25.4%)

Students (grades 9-12):


- 24.3% active (vs. 17.1%)
- 30.4% daily physical education (vs. 30.3%)


ADIPOSIITY AND COGNITION




PHYSICAL ACTIVITY AND COGNITION

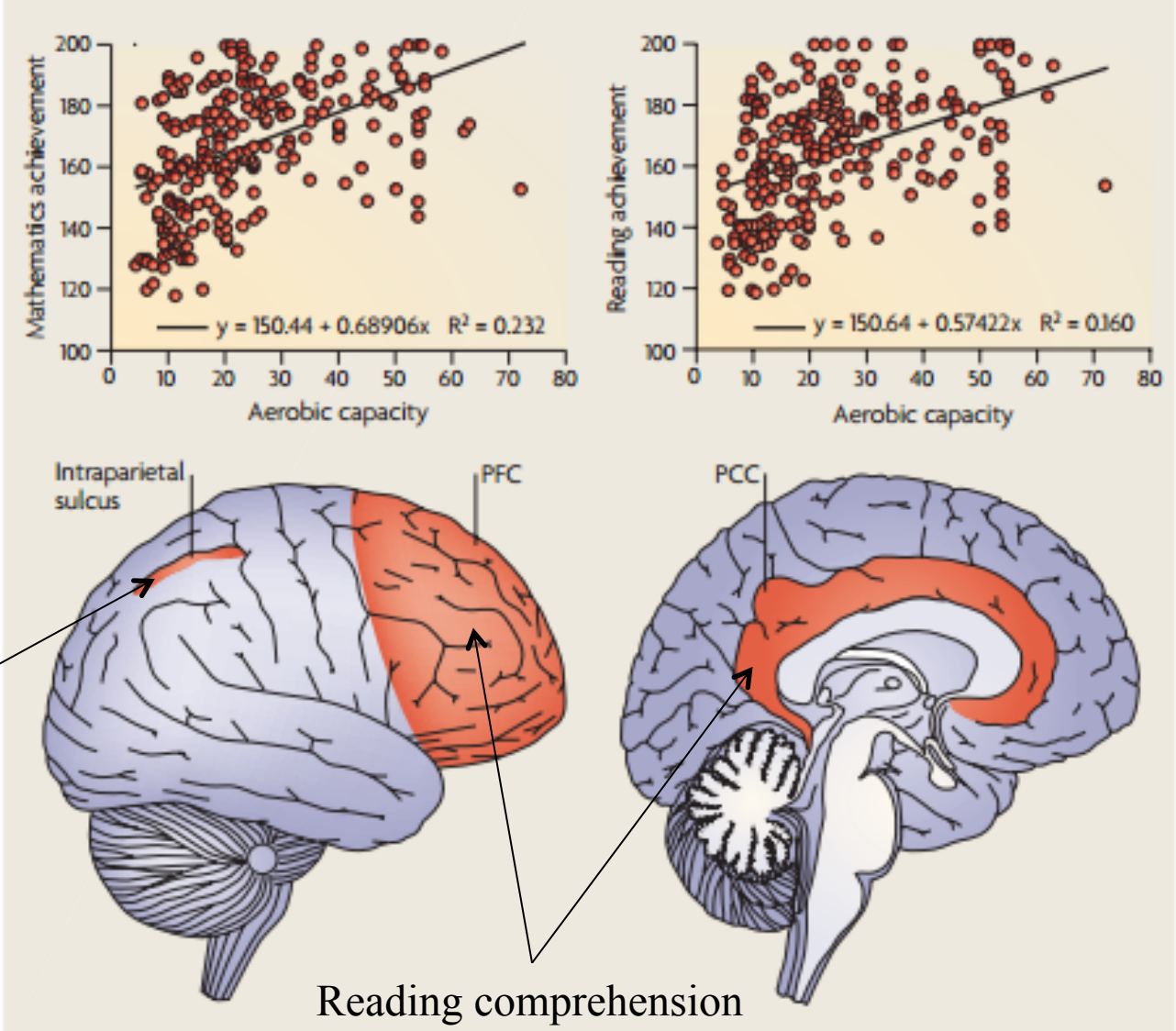
Exercise in middle childhood  ↑ Executive function (Davis et al., 2011)

Sedentary behavior before age 3  Adverse effects on cognitive development at age 6
(*mathematics score, reading recognition and reading comprehension*)
(Zimmerman & Christakis 2005)

Aerobic physical activity  ↑ Cognitive performance in school-age children
(*perceptual skills, intelligence quotient, achievement, verbal tests, mathematic tests, memory, developmental level/academic readiness*)
(Sibley & Etnier 2003)

Fitness  Neurophysiological indices of attention and working memory and response speed, cognitive processing speed in children
(Hillman et al. 2005)

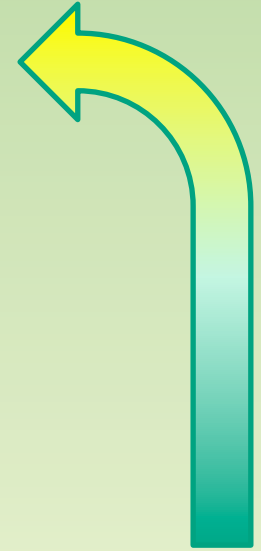
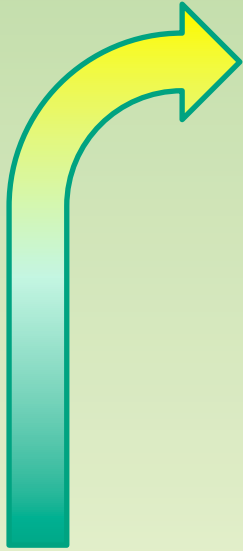
PHYSICAL ACTIVITY AND COGNITION



Mathematical calculations

Reading comprehension

**COGNITIVE
FUNCTIONING**



**PHYSICAL
(IN)ACTIVITY**



**EXCESS
BODY WEIGHT**

AIMS OF THE STUDY

The primary purposes are to examine the resting brain activity in relation to (1) % fat mass, (2) physical activity/inactivity and (3) cognitive development in a sub-group of 4-5-year old CANDLE children.

The secondary aims of this study are to examine:

- a) brain responses to tones;
- b) brain responses to speech sounds.

SUBJECT SELECTION

- Population Pool:

4-5 yr. olds who participate in the Preschool CANDLE visit

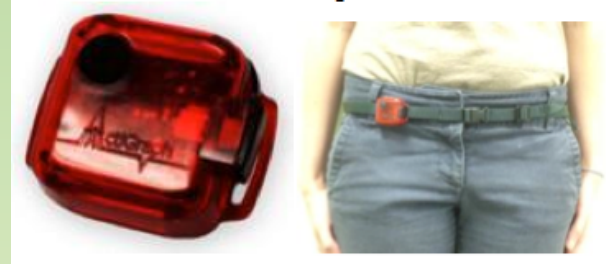
Meet the inclusion/exclusion criteria:

- Born full term (37-42 weeks gestation)
- BMI percentile $>5^{\text{th}}$
- Neonatal stroke
- Grade IV intraventricular haemorrhage
- Periventricular leukomalacia
- Prenatal drug exposure
- Possible autism (M-CHAT at CV2)
- Hyperactivity-attention problem (CBCL-3 at CV3)
- Metal, internal hardware in the body
- Serious head injury, unconsciousness for more than 2 min
- Refused consent

PHYSICAL ACTIVITY/INACTIVITY

ACCELEROMETER:

ActiGraph, GT1M
Pensacola FL, USA



- Measures acceleration in the vertical plane
- Noninvasive
- Activity counts, steps taken and intensity of exercise
- 7 consecutive days (3 days used for analysis)
- Sedentary- and light-, moderate- and vigorous
- ***Study questionnaire:*** Screen time and media use
Extra curricular physical activity

DUAL ENERGY X-RAY ABSORPTIOMETRY



Hologic Inc., Waltham MA, USA

- Reference method
- Noninvasive assessment of % Body Fat
- 3 minutes to measure whole body

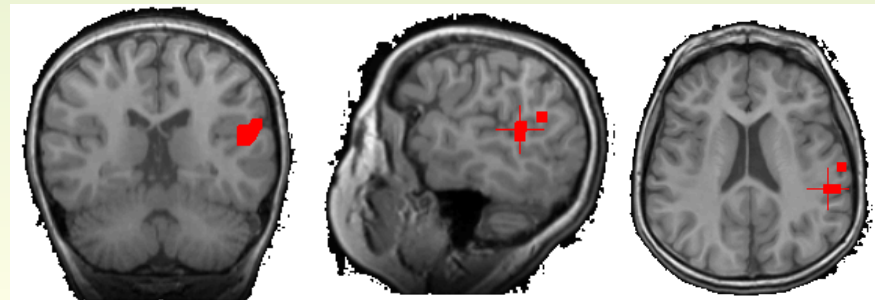
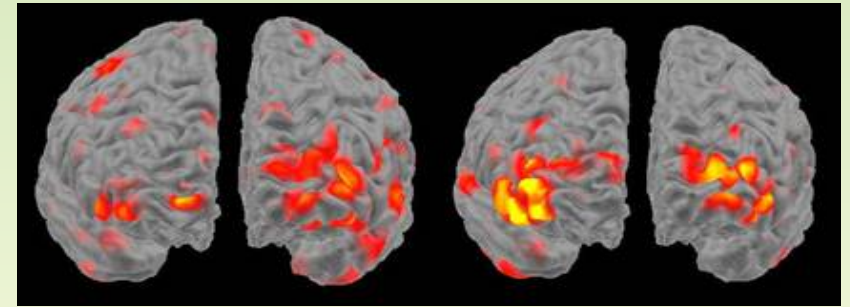
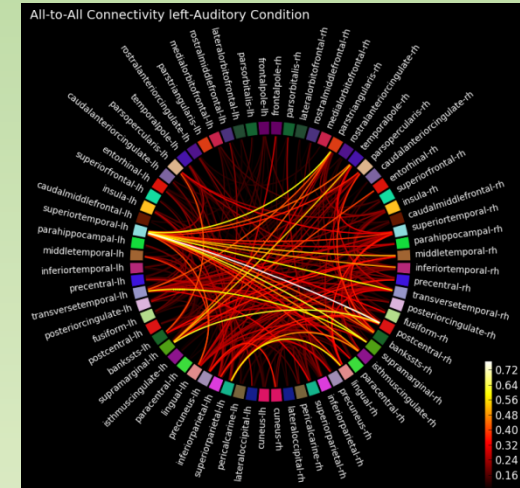
DXA Results Summary:

Region	BMC (g)	Fat (g)	Lean (g)	Lean+BMC (g)	Total Mass (g)	% Fat
L Arm	96.60	1975.3	1494.9	1591.5	3566.8	55.4
R Arm	95.72	1904.1	1486.4	1582.1	3486.2	54.6
Trunk	356.99	11599.2	14733.2	15090.2	26689.3	43.5
L Leg	269.04	4775.1	5455.8	5724.9	10500.0	45.5
R Leg	290.06	4929.7	5750.6	6040.6	10970.3	44.9
Subtotal	1108.41	25183.4	28920.9	30029.3	55212.7	45.6
Head	306.61	859.4	2900.8	3207.4	4066.8	21.1
Total	1415.02	26042.8	31821.7	33236.8	59279.6	43.9

TBAR1207

MAGNETOENCEPHALOGRAPHY (MEG)

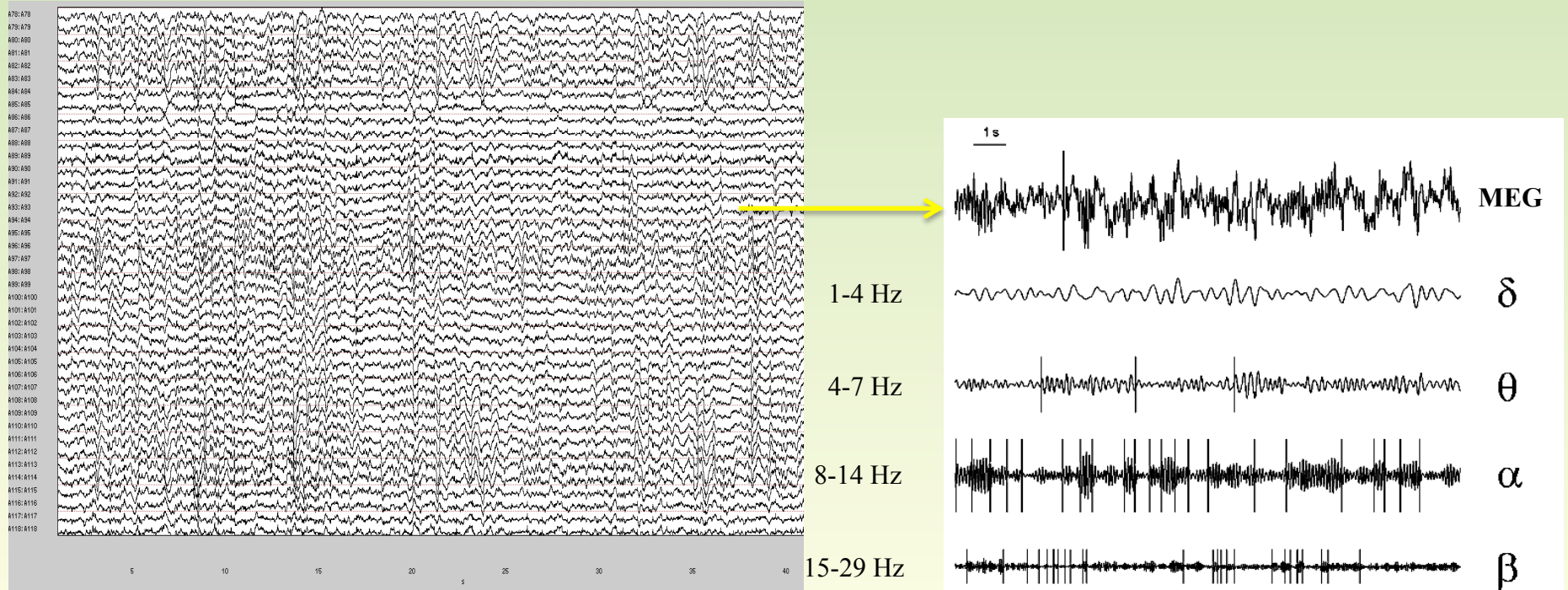
Le Bonheur's MEG Clinic



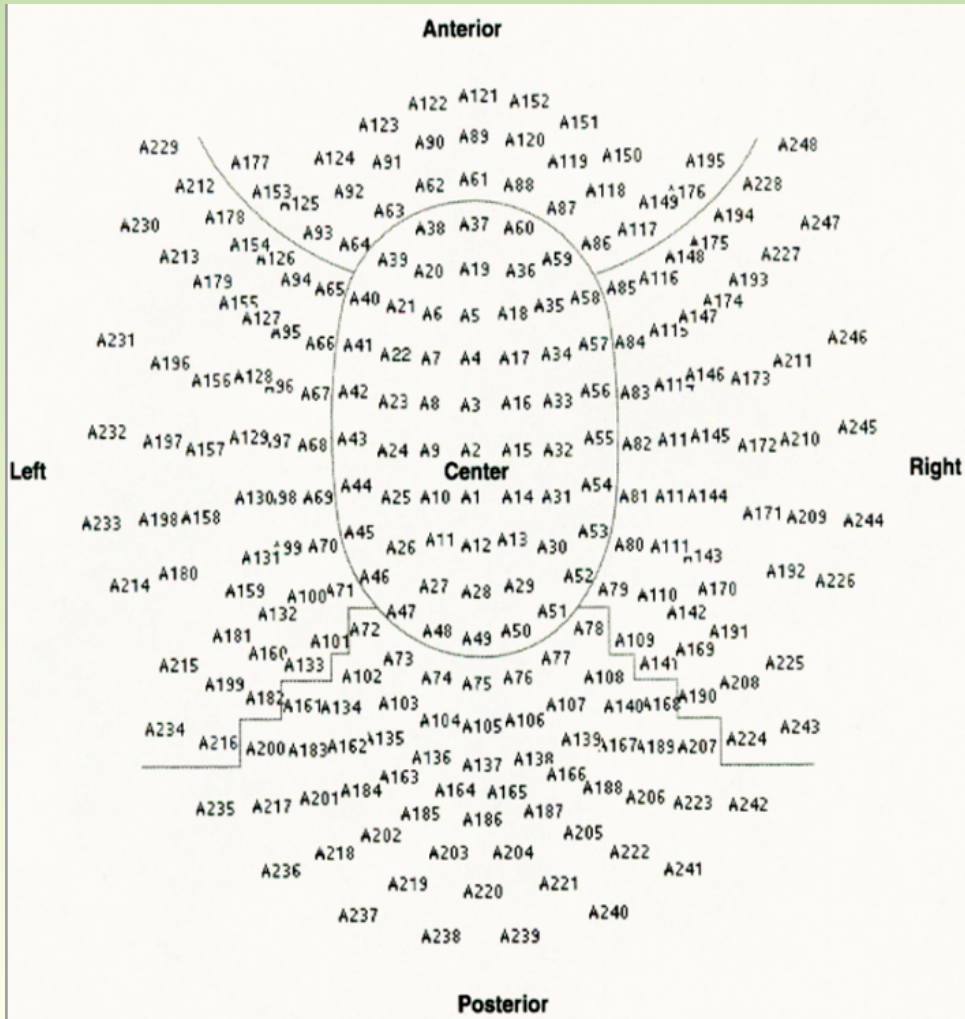
- (1) MEG is a noninvasive functional mapping technique
- (2) Derives profiles of brain activity based on changing magnetic fields associated with neural activity.

MEG METHODS

- Fast-Fourier Transform (FFT)
- Decomposing a sequence of values into components of different frequencies. (5 x 5sec EPOCH)



MEG METHODS



LEFT HEMISPHERE

	Delta	Theta	Alpha	Beta
Anterior				
Temporal				
Center				
Posterior				

Mean regional power (magnitude)

RIGHT HEMISPHERE

	Delta	Theta	Alpha	Beta
Anterior				
Temporal				
Center				
Posterior				

Mean regional power (magnitude)

PHYSICAL ACTIVITY AND NEUROIMAGING

Baseline spectral frequency distribution analysis (EEG)

Better aerobic fitness

↑ mean frequency Delta, Theta, Beta

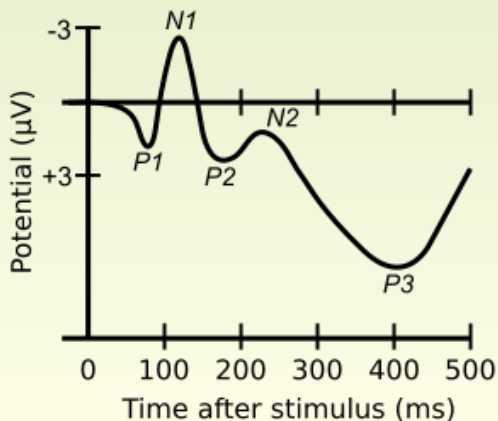
↑ activation Theta, Alpha, Beta

(Bashore 1989, Dustman et al. 1985, 1990, Lardon & Polich 1996)

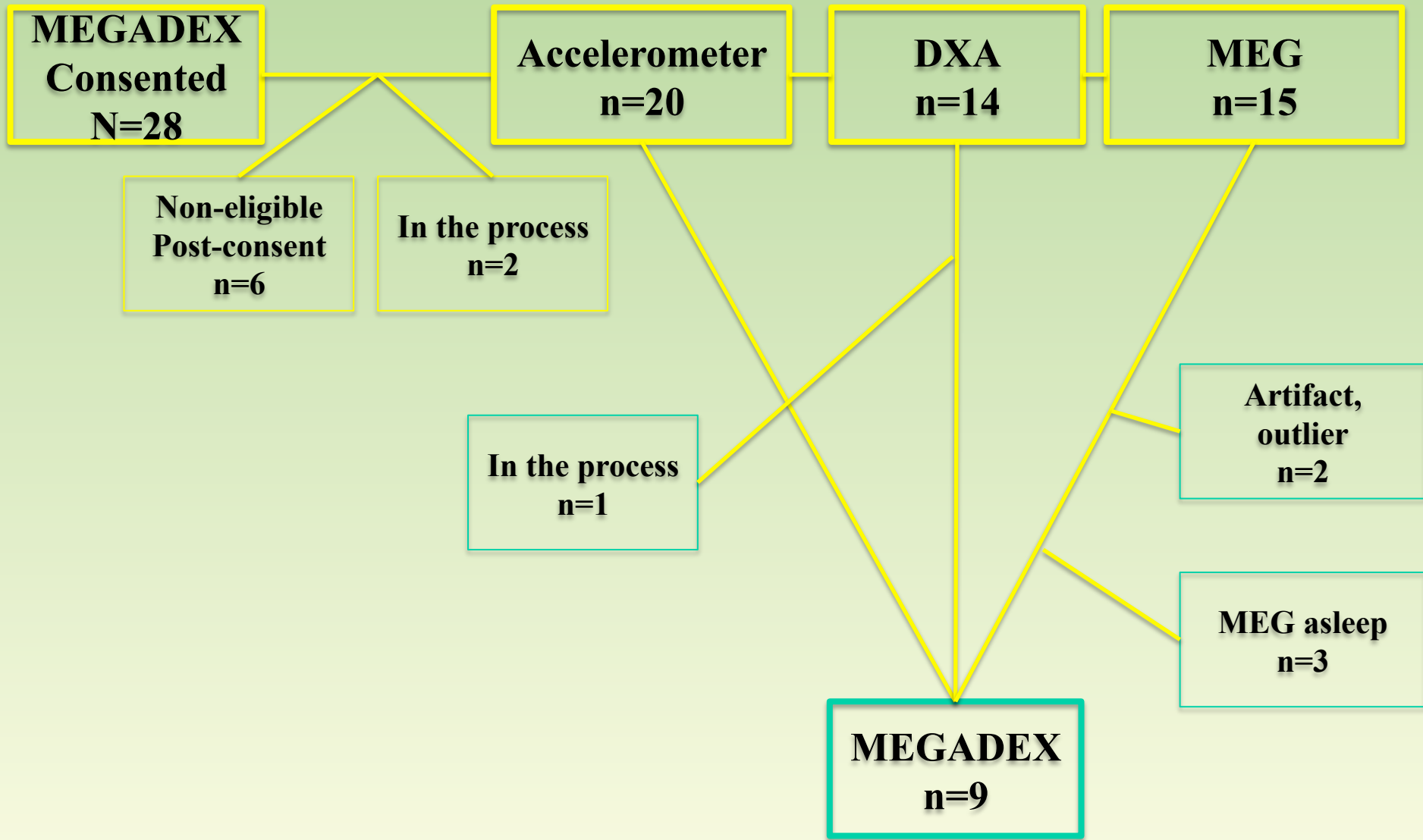
Inter-individual variability of baseline spectral frequency activation

Individual variation of P300 component of the ERP

(Mecklinger et al. 1992, Polich & Lardon 1997)



P300 (P3) : Higher cognitive response to unexpected and/or cognitively salient stimuli.



SUBJECTS

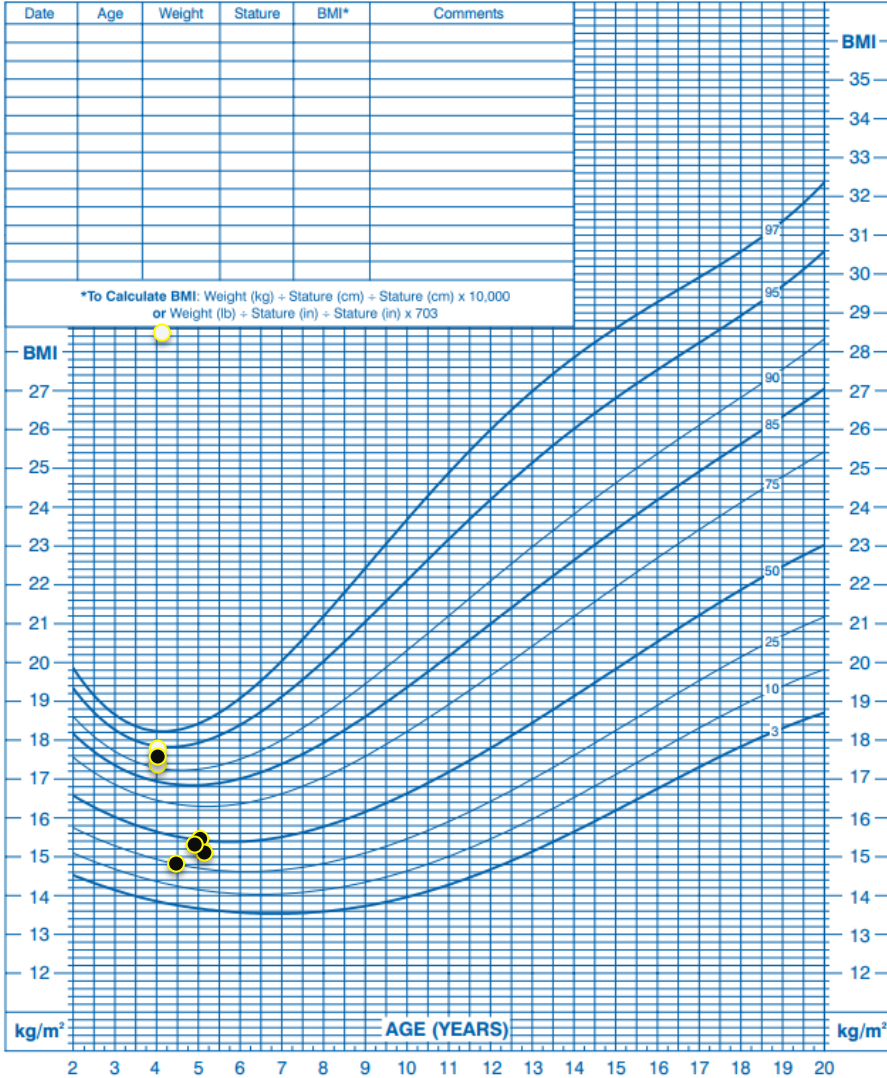
Table 1. Basic characteristics of the study participants

Characteristics	MEAN ± SD	RANGE
Mother's Age (yrs)	28.0 ± 4.4	22-39
Mother's IQ	88.9 ± 20.57	60 -126
Mother's BMI (kg/m ²)	32.9 ± 11.1	21 - 60
Race/Gender	77% AA, 60% girl	
Child's Age (months)	53.5 ± 5.4	46 – 62
Height (cm)	107.8 ± 4.9	98 - 115
Weight (kg)	20.3 ± 6.1	15 - 38
BMI for Age percentile	61.5 ± 28.1	14 - 100
VIQ percentile	44.3 ± 26.6	5 - 86
NVIQ percentile	43.7 ± 30.2	3 - 96
FSIQ percentile	43.1 ± 27.0	3 - 88

2 to 20 years: Boys

Body mass index-for-age percentiles

NAME _____ RECORD # _____



Published May 30, 2000 (modified 10/16/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with
the National Center for Chronic Disease Prevention and Health Promotion (2000).
<http://www.cdc.gov/growthcharts>

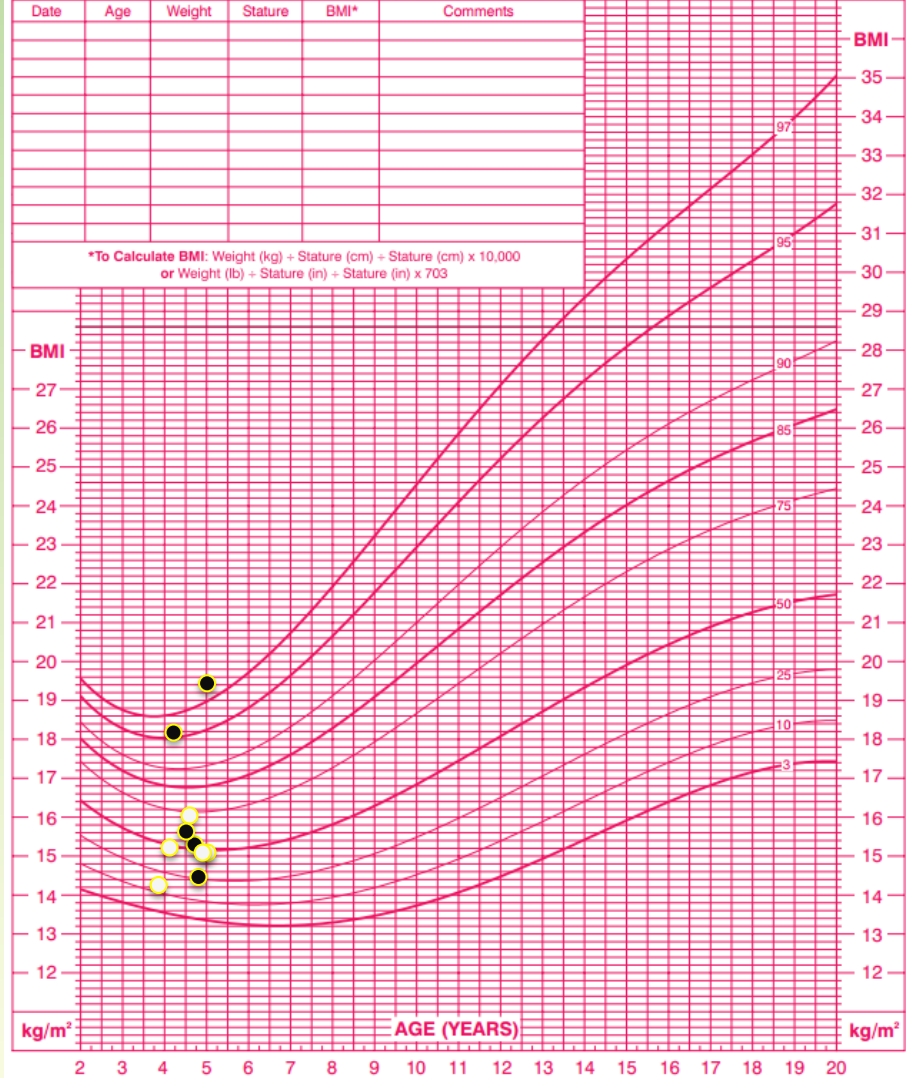


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2 to 20 years: Girls

Body mass index-for-age percentiles

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BODY COMPOSITION RESULTS

Table 2. Body composition of the study participants

Characteristics	MEAN \pm SD	RANGE
Mother's BMI (kg/m ²)	32.9 \pm 11.1	21 - 60
BMI for Age percentile	61.5 \pm 28.1	14 - 100
Fat Mass (kg)	4.7 \pm 3.1	2- 13
Fat Mass (%)	26.2 \pm 8.9	13 -39
Lean Mass (kg)	11.5 \pm 1.7	9 - 14



PHYSICAL (IN)ACTIVITY RESULTS

Accelerometer:

- Average steps/day: $8,359 \pm 3,005$ (4,077-15,391)
- 10.3 ± 1.9 hrs/day in sedentary and light activity
- 1.3 ± 0.4 hrs/day in moderate exercise
- 0.5 ± 0.3 hrs/day in vigorous exercise

12,000 STEPS/DAY

Questionnaire:

- 79% of the children were active at least for 60 min 5 times a week
- 64% watching TV at least 2 hrs per weekday,
- 50% watching TV at least 2 hrs per weekend day.
- On average children spend 2.3 hrs in screen time (watching TV, playing video games) on a weekend day and 2.5 hrs on a weekday.

2 HRS/DAY

BODY COMPOSITION AND REGIONAL SPECTRAL POWER

	FAT MASS	LEAN MASS	BODY MASS	FAT MASS (%)	BMI pct
D_anterior_R	-.5581 p=.193	-.0534 p=.909	-.4357 p=.329	-.4777 p=.278	-.0969 p=.836
D_temporal_R	-.3930 p=.383	.0958 p=.838	-.2322 p=.616	-.3888 p=.389	.0759 p=.871
D_central_R	-.6167 p=.140	.2679 p=.561	-.2986 p=.515	-7007 p=.079	-.3051 p=.506
D_posterior_R	-.3365 p=.461	.0521 p=.912	-.2155 p=.643	-.3256 p=.476	.0840 p=.858
T_anterior_R	-.3757 p=.406	.4948 p=.259	.0035 p=.994	-.5591 p=.192	-.5076 p=.245
T_temporal_R	-.4077 p=.364	.5994 p=.155	.0387 p=.934	-.6493 p=.115	-.3737 p=.409
T_central_R	-.5115 p=.241	.5471 p=.204	-.0660 p=.888	-7428 p=.056	-.6472 p=.116
T_posterior_R	-.3106 p=.498	.5603 p=.191	.0875 p=.852	-.5599 p=.191	-.3016 p=.511
A_anterior_R	-.3312 p=.468	-.2738 p=.552	-.3940 p=.382	-.1673 p=.720	-.0379 p=.936
A_temporal_R	-.0787 p=.867	.6464 p=.117	.3042 p=.507	-.3634 p=.423	-.3195 p=.485
A_central_R	-.2324 p=.616	.6134 p=.143	.1740 p=.709	-.5002 p=.253	-.5184 p=.233
A_posterior_R	-.0459 p=.922	.6088 p=.147	.3071 p=.503	-.3265 p=.475	-.2867 p=.533
B_anterior_R	-7100 p=.074	-.3386 p=.457	-7056 p=.076	-.5399 p=.211	-.2755 p=.550
B_temporal_R	-7985 p=.031	-.0937 p=.842	-.6330 p=.127	-7556 p=.049	-.5790 p=.173
B_central_R	-7099 p=.074	.1501 p=.748	-.4322 p=.333	-7869 p=.036	-.6687 p=.100
B_posterior_R	-.6301 p=.129	-.0408 p=.931	-.4810 p=.274	-.6243 p=.134	-.4126 p=.358

	FAT MASS	LEAN MASS	BODY MASS	FAT MASS (%)	BMI pct
D_anterior_L	-.3751 p=.407	-.0999 p=.831	-.3286 p=.472	-.2855 p=.535	.1438 p=.758
D_temporal_L	-.1521 p=.745	-.0879 p=.851	-.1597 p=.732	-.0661 p=.888	.3153 p=.491
D_central_L	-7028 p=.078	.1543 p=.741	-.4248 p=.342	-.7391 p=.058	-.5313 p=.220
D_posterior_L	-.3205 p=.483	-.0576 p=.902	-.2652 p=.565	-.2598 p=.574	.0662 p=.888
T_anterior_L	-.1770 p=.704	.6430 p=.119	.2309 p=.618	-.4222 p=.345	-.2244 p=.629
T_temporal_L	-.1924 p=.679	.5134 p=.239	.1472 p=.753	-.4016 p=.372	-.0834 p=.859
T_central_L	-.5665 p=.185	.5147 p=.237	-.1241 p=.791	-7878 p=.035	-6792 p=.093
T_posterior_L	-.4007 p=.373	.4235 p=.344	-.0546 p=.907	-.5842 p=.168	-.3031 p=.509
A_anterior_L	-.3066 p=.504	-.5041 p=.249	-.5048 p=.248	-.0370 p=.937	.1820 p=.696
A_temporal_L	.0336 p=.943	.6630 p=.105	.3952 p=.380	-.2576 p=.577	-.1257 p=.788
A_central_L	-.3541 p=.436	.4717 p=.285	.0062 p=.989	-.5612 p=.190	-.6577 p=.108
A_posterior_L	-.1901 p=.683	.2578 p=.577	.0059 p=.990	-.3053 p=.505	-.2705 p=.557
B_anterior_L	-.4888 p=.266	-.3555 p=.434	-.5542 p=.197	-.3002 p=.513	.0529 p=.910
B_temporal_L	-.5561 p=.195	-.1520 p=.745	-.4893 p=.265	-.4792 p=.277	-.1940 p=.677
B_central_L	-8148 p=.026	.1051 p=.823	-.5337 p=.217	-8584 p=.013	-6930 p=.084
B_posterior_L	-.6388 p=.122	-.0825 p=.860	-.5107 p=.242	-.6090 p=.147	-.3775 p=.404

IQ (Stanford-Binet) AND REGIONAL SPECTRAL POWER

	Non Verbal IQ Pct	Verbal IQ_Pct	Full Scale IQ Pct
D_anterior_R	-.5430 p=.208	-.0741 p=.875	-.4128 p=.357
D_temporal_R	-.5422 p=.209	-.2701 p=.558	-.4965 p=.257
D_central_R	-.7691 p=.043	-.3157 p=.490	-.7142 p=.071
D_posterior_R	-.5823 p=.170	-.1672 p=.720	-.4939 p=.260
T_anterior_R	-.6722 p=.098	-.8119 p=.027	-.8731 p=.010
T_temporal_R	-.8283 p=.021	-.6098 p=.146	-.9083 p=.005
T_central_R	-.7872 p=.036	-.5433 p=.208	-.8646 p=.012
T_posterior_R	-.7802 p=.038	-.3602 p=.427	-.7776 p=.040
A_anterior_R	-.0424 p=.928	-.6173 p=.140	-.2493 p=.590
A_temporal_R	-.5556 p=.195	-.7770 p=.040	-.7858 p=.036
A_central_R	-.6137 p=.143	-.7072 p=.076	-.8062 p=.029
A_posterior_R	-.5274 p=.224	-.6688 p=.100	-.7229 p=.066
B_anterior_R	-.2395 p=.605	-.0886 p=.850	-.1881 p=.686
B_temporal_R	-.5400 p=.211	-.0446 p=.924	-.4350 p=.329
B_central_R	-.6662 p=.102	-.0631 p=.893	-.5626 p=.189
B_posterior_R	-.5421 p=.209	.2591 p=.575	-.3173 p=.488

	Non Verbal IQ Pct	Verbal IQ_Pct	Full Scale IQ Pct
D_anterior_L	-.2664 p=.564	.2600 p=.573	-.0533 p=.910
D_temporal_L	-.4187 p=.350	-.0451 p=.924	-.3034 p=.508
D_central_L	-.8930 p=.007	-.0411 p=.930	-.7111 p=.073
D_posterior_L	-.5993 p=.155	-.1161 p=.804	-.4877 p=.267
T_anterior_L	-.7685 p=.044	-.8030 p=.030	-.9401 p=.002
T_temporal_L	-.8655 p=.012	-.2039 p=.661	-.7674 p=.044
T_central_L	-.8682 p=.011	-.2794 p=.544	-.8209 p=.024
T_posterior_L	-.8249 p=.022	-.1891 p=.685	-.7340 p=.060
A_anterior_L	.2324 p=.616	-.0548 p=.907	.2188 p=.637
A_temporal_L	-.7202 p=.068	-.5892 p=.164	-.8346 p=.019
A_central_L	-.6579 p=.108	-.6132 p=.143	-.8042 p=.029
A_posterior_L	-.5456 p=.205	-.6305 p=.129	-.7042 p=.077
B_anterior_L	-.2278 p=.623	.3219 p=.481	.0015 p=.997
B_temporal_L	-.5318 p=.219	.3611 p=.426	-.2483 p=.591
B_central_L	-.7325 p=.061	.1053 p=.822	-.5360 p=.215
B_posterior_L	-.5301 p=.221	.1876 p=.687	-.3316 p=.468

PHYSICAL ACTIVITY AND REGIONAL SPECTRAL POWER

	Activity count	Steps	SLPA	MPA	VPA	MVPA
D_anterior_R	.5843 p=.168	.4693 p=.288	-.1435 p=.759	.5752 p=.177	.6658 p=.103	.6265 p=.132
D_temporal_R	.7275 p=.064	.6194 p=.138	.1061 p=.821	.7570 p=.049	.7633 p=.046	.7807 p=.038
D_central_R	.7361 p=.059	.6649 p=.103	.2479 p=.592	.7349 p=.060	.7445 p=.055	.7592 p=.048
D_posterior_R	.6180 p=.139	.5301 p=.221	.0816 p=.862	.6926 p=.085	.6102 p=.146	.6801 p=.093
T_anterior_R	.8087 p=.028	.8519 p=.015	.6323 p=.128	.7377 p=.058	.7177 p=.069	.7507 p=.052
T_temporal_R	.7915 p=.034	.7773 p=.040	.6583 p=.108	.7779 p=.039	.7010 p=.079	.7699 p=.043
T_central_R	.6171 p=.140	.6525 p=.112	.5899 p=.163	.5696 p=.182	.5277 p=.224	.5693 p=.182
T_posterior_R	.5413 p=.210	.5325 p=.219	.5915 p=.162	.5808 p=.172	.4266 p=.340	.5372 p=.214
A_anterior_R	.7401 p=.057	.7483 p=.053	-.0172 p=.971	.7094 p=.074	.8114 p=.027	.7689 p=.043
A_temporal_R	.6357 p=.125	.7030 p=.078	.8349 p=.019	.6226 p=.135	.4794 p=.276	.5845 p=.168
A_central_R	.5797 p=.173	.6552 p=.110	.7491 p=.053	.5360 p=.215	.4414 p=.321	.5144 p=.238
A_posterior_R	.5316 p=.219	.6033 p=.152	.7958 p=.032	.5459 p=.205	.3666 p=.419	.4916 p=.263
B_anterior_R	.4729 p=.284	.4317 p=.333	-.2927 p=.524	.4613 p=.297	.6087 p=.147	.5315 p=.220
B_temporal_R	.3849 p=.394	.3819 p=.398	-.0943 p=.841	.3824 p=.397	.4378 p=.326	.4147 p=.355
B_central_R	.3104 p=.498	.3291 p=.471	.1230 p=.793	.3104 p=.498	.2963 p=.519	.3136 p=.493
B_posterior_R	.1236 p=.792	.0913 p=.846	-.1401 p=.764	.1695 p=.716	.1493 p=.749	.1664 p=.721

	Activity count	Steps	SLPA	MPA	VPA	MVPA
D_anterior_L	.2506 p=.588	.0891 p=.849	-.3148 p=.492	.2426 p=.600	.3863 p=.392	.3052 p=.506
D_temporal_L	.5011 p=.252	.3896 p=.388	-.0856 p=.855	.5850 p=.168	.5067 p=.246	.5710 p=.181
D_central_L	.4738 p=.283	.4293 p=.336	.0479 p=.919	.4789 p=.277	.4497 p=.311	.4810 p=.275
D_posterior_L	.5643 p=.187	.4951 p=.259	-.0065 p=.989	.6589 p=.107	.5331 p=.218	.6286 p=.131
T_anterior_L	.8744 p=.010	.8750 p=.010	.7703 p=.043	.8579 p=.014	.7389 p=.058	.8358 p=.019
T_temporal_L	.5143 p=.238	.4575 p=.302	.4800 p=.276	.5918 p=.162	.3817 p=.398	.5268 p=.224
T_central_L	.4469 p=.315	.4604 p=.299	.4558 p=.304	.4172 p=.352	.3612 p=.426	.4072 p=.365
T_posterior_L	.4850 p=.270	.4555 p=.304	.4058 p=.366	.5400 p=.211	.3918 p=.385	.4976 p=.256
A_anterior_L	.3322 p=.467	.2512 p=.587	-.4781 p=.278	.2866 p=.533	.5244 p=.227	.3870 p=.391
A_temporal_L	.5838 p=.169	.6159 p=.141	.8093 p=.027	.6464 p=.117	.3766 p=.405	.5598 p=.191
A_central_L	.5156 p=.236	.6110 p=.145	.6061 p=.149	.4781 p=.278	.3786 p=.402	.4529 p=.307
A_posterior_L	.6289 p=.130	.7067 p=.076	.5258 p=.225	.6859 p=.089	.4839 p=.271	.6267 p=.132
B_anterior_L	.2055 p=.658	.0842 p=.858	-.4860 p=.269	.2349 p=.612	.3427 p=.452	.2834 p=.538
B_temporal_L	.1427 p=.760	.0616 p=.896	-.2939 p=.522	.2067 p=.657	.1870 p=.688	.2048 p=.659
B_central_L	.2622 p=.570	.2408 p=.603	-.0304 p=.948	.2460 p=.595	.2852 p=.535	.2681 p=.561
B_posterior_L	.2093 p=.652	.1758 p=.706	-.1457 p=.755	.2570 p=.578	.2415 p=.602	.2582 p=.576

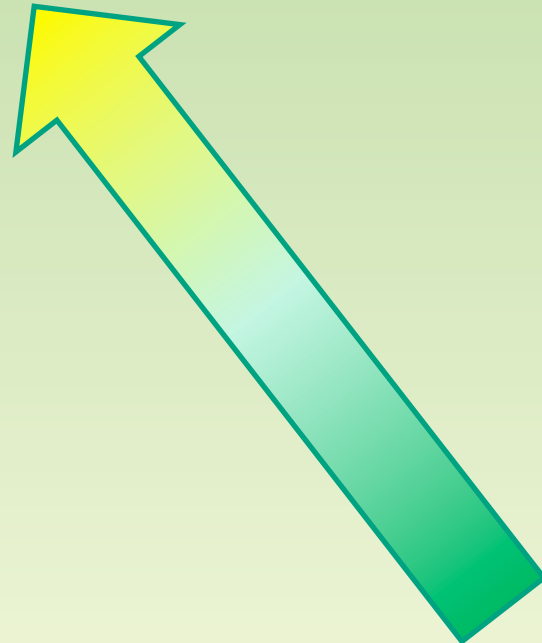
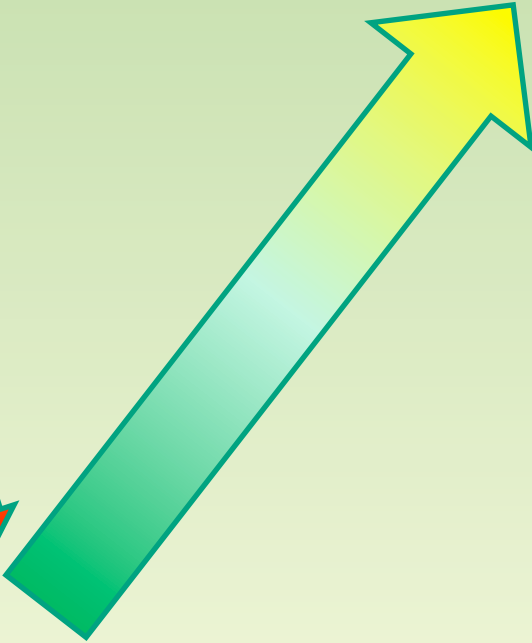
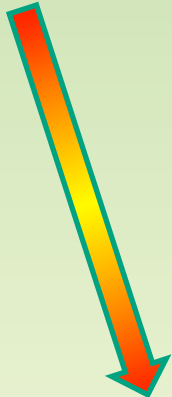
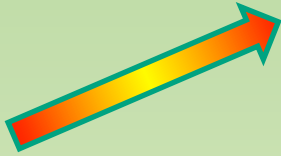
REPORTED PHYSICAL (IN)ACTIVITY AND REGIONAL SPECTRAL POWER

	Usual PA/week	Screentime weekday	Screentime weekend
D_anterior_R	-.8153 p=.025	.3925 p=.384	.5396 p=.211
D_temporal_R	-.8422 p=.017	.5691 p=.182	.6157 p=.141
D_central_R	-.7267 p=.064	.3228 p=.480	.2392 p=.605
D_posterior_R	-.6706 p=.099	.6548 p=.110	.5640 p=.187
T_anterior_R	-.5313 p=.220	-.3496 p=.442	-.3026 p=.509
T_temporal_R	-.5735 p=.178	-.0530 p=.910	-.1654 p=.723
T_central_R	-.3318 p=.467	-.2867 p=.533	-.4543 p=.306
T_posterior_R	-.3009 p=.512	.0798 p=.865	-.2158 p=.642
A_anterior_R	-.6775 p=.094	.5374 p=.213	.6587 p=.108
A_temporal_R	-.2253 p=.627	-.2702 p=.558	-.4267 p=.340
A_central_R	-.1904 p=.683	-.4226 p=.345	-.5611 p=.190
A_posterior_R	-.1031 p=.826	-.1662 p=.722	-.4234 p=.344
B_anterior_R	-.5382 p=.213	.7279 p=.064	.6096 p=.146
B_temporal_R	-.3005 p=.513	.4495 p=.312	.1368 p=.770
B_central_R	-.1320 p=.778	.1709 p=.714	-.2077 p=.655
B_posterior_R	-.1103 p=.814	.4540 p=.306	.0734 p=.876

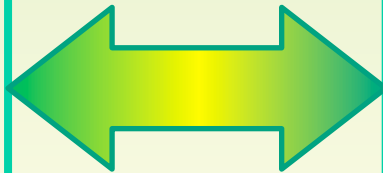
	Usual PA/ week	Screentime weekday	Screentime weekend
D_anterior_L	-.6587 p=.108	.3751 p=.407	.5926 p=.161
D_temporal_L	-.6833 p=.091	.6437 p=.119	.7137 p=.072
D_central_L	-.4782 p=.278	.0905 p=.847	-.0367 p=.938
D_posterior_L	-.5969 p=.157	.6750 p=.096	.5587 p=.192
T_anterior_L	-.6315 p=.128	-.2187 p=.637	-.1747 p=.708
T_temporal_L	-.4153 p=.354	.1234 p=.792	-.0590 p=.900
T_central_L	-.2399 p=.604	-.2945 p=.521	-.5081 p=.244
T_posterior_L	-.3281 p=.472	.1967 p=.672	-.1039 p=.825
A_anterior_L	-.6296 p=.130	.5660 p=.185	.8646 p=.012
A_temporal_L	-.2223 p=.632	-.0889 p=.850	-.3226 p=.480
A_central_L	-.1107 p=.813	-.3847 p=.394	-.5878 p=.165
A_posterior_L	-.2121 p=.648	.2594 p=.574	-.0644 p=.891
B_anterior_L	-.5241 p=.227	.6862 p=.089	.7094 p=.074
B_temporal_L	-.2872 p=.532	.5556 p=.195	.3265 p=.475
B_central_L	-.2287 p=.622	.1091 p=.816	-.1682 p=.718
B_posterior_L	-.1936 p=.678	.5405 p=.210	.1798 p=.700

**COGNITIVE
FUNCTIONING**

IQ



**PHYSICAL
(IN)ACTIVITY**



**EXCESS
BODY WEIGHT**

PHYSICAL ACTIVITY AND REGIONAL SPECTRAL POWER

	Activity count	Steps	SLPA	MPA	VPA	MVPA
D_anterior_R	.8257 p=.012	.5710 p=.139	.1918 p=.680	.8747 p=.004	.8966 p=.003	.9180 p=.001
D_temporal_R	.8384 p=.009	.5935 p=.121	.2525 p=.585	.9180 p=.001	.8777 p=.004	.9373 p=.001
D_central_R	.7682 p=.026	.5367 p=.170	.3674 p=.417	.8217 p=.012	.7986 p=.017	.8444 p=.008
D_posterior_R	.7106 p=.048	.5148 p=.192	.1350 p=.773	.8394 p=.009	.6945 p=.056	.8121 p=.014
T_anterior_R	.5777 p=.134	.4251 p=.294	.7423 p=.056	.5556 p=.153	.5679 p=.142	.5828 p=.129
T_temporal_R	.6710 p=.069	.5038 p=.203	.7321 p=.061	.6959 p=.055	.6147 p=.105	.6897 p=.058
T_central_R	.4846 p=.224	.4024 p=.323	.6344 p=.126	.4555 p=.257	.4258 p=.293	.4613 p=.250
T_posterior_R	.3846 p=.347	.3199 p=.440	.5212 p=.230	.4529 p=.260	.2584 p=.537	.3899 p=.340
A_anterior_R	.7203 p=.044	.6461 p=.083	.0593 p=.900	.7001 p=.053	.8121 p=.014	.7745 p=.024
A_temporal_R	.5597 p=.149	.5231 p=.183	.8820 p=.009	.5612 p=.148	.4419 p=.273	.5337 p=.173
A_central_R	.4743 p=.235	.4456 p=.268	.8214 p=.023	.4413 p=.274	.3730 p=.363	.4304 p=.287
A_posterior_R	.1464 p=.729	.1041 p=.806	.8907 p=.007	.1938 p=.646	.0199 p=.963	.1294 p=.760
B_anterior_R	.7068 p=.050	.7198 p=.044	-.1543 p=.741	.6819 p=.063	.7692 p=.026	.7449 p=.034
B_temporal_R	.5291 p=.178	.5951 p=.120	-.0460 p=.922	.5106 p=.196	.5134 p=.193	.5317 p=.175
B_central_R	.3739 p=.362	.4701 p=.240	.1142 p=.807	.3539 p=.390	.2982 p=.473	.3446 p=.403
B_posterior_R	.1576 p=.709	.2209 p=.599	-.2204 p=.635	.1910 p=.651	.1144 p=.787	.1665 p=.694

	Activity count	Steps	SLPA	MPA	VPA	MVPA
D_anterior_L	.7282 p=.041	.4369 p=.279	.2032 p=.662	.7865 p=.021	.8313 p=.011	.8358 p=.010
D_temporal_L	.7810 p=.022	.5739 p=.137	.1039 p=.825	.9135 p=.002	.7648 p=.027	.8873 p=.003
D_central_L	.7201 p=.044	.5467 p=.161	.2329 p=.615	.7726 p=.025	.6953 p=.056	.7707 p=.025
D_posterior_L	.7334 p=.038	.6009 p=.115	.0740 p=.875	.8744 p=.004	.6683 p=.070	.8228 p=.012
T_anterior_L	.7749 p=.024	.6332 p=.092	.8146 p=.026	.7911 p=.019	.6855 p=.061	.7783 p=.023
T_temporal_L	.4741 p=.235	.3589 p=.383	.4257 p=.341	.5928 p=.121	.3140 p=.449	.5001 p=.207
T_central_L	.4029 p=.322	.3273 p=.429	.4589 p=.300	.3937 p=.335	.3275 p=.428	.3817 p=.351
T_posterior_L	.3913 p=.338	.3010 p=.469	.3263 p=.475	.4834 p=.225	.2847 p=.494	.4198 p=.301
A_anterior_L	.5691 p=.141	.5111 p=.195	-.3287 p=.472	.5105 p=.196	.7202 p=.044	.6178 p=.103
A_temporal_L	.6056 p=.112	.5493 p=.158	.8315 p=.020	.6904 p=.058	.4202 p=.300	.6050 p=.112
A_central_L	.4655 p=.245	.4966 p=.211	.6590 p=.107	.4293 p=.288	.3434 p=.405	.4105 p=.312
A_posterior_L	.4308 p=.287	.4876 p=.220	.5079 p=.245	.5169 p=.190	.2632 p=.529	.4318 p=.285
B_anterior_L	.4685 p=.242	.4491 p=.264	-.4801 p=.276	.4851 p=.223	.5091 p=.198	.5139 p=.193
B_temporal_L	.3733 p=.362	.4022 p=.323	-.3027 p=.509	.4269 p=.292	.3207 p=.439	.3992 p=.327
B_central_L	.3495 p=.396	.4260 p=.293	-.0577 p=.902	.3101 p=.455	.2956 p=.477	.3162 p=.446
B_posterior_L	.2594 p=.535	.3264 p=.430	-.2071 p=.656	.2920 p=.483	.2162 p=.607	.2718 p=.515

SUMMARY

Babiloni et al. 2011 suggest that abnormal weight in healthy overweight/obese subjects is related to abnormal cortical neural synchronization at the basis of resting state **alpha rhythms** and fluctuation of global brain arousal.

	FAT MASS	LEAN MASS	BODY MASS	FAT MASS (%)	BMI pct
T_central_R	p=.364 -.5115	p=.155 .5471	p=.934 -.0660	p=.115 -.7428	p=.409 -.6472
T_posterior_R	p=.241 -.3106	p=.204 .5603	p=.888 .0875	p=.056 -.5599	p=.116 -.3016
A_anterior_R	p=.498 -.3312	p=.191 -.2738	p=.852 -.3940	p=.191 -.1673	p=.511 -.0379
A_temporal_R	p=.468 -.0787	p=.552 .6464	p=.382 .3042	p=.720 -.3634	p=.936 -.3195
A_central_R	p=.867 -.2324	p=.117 .6134	p=.507 .1740	p=.423 -.5002	p=.485 -.5184
A_posterior_R	p=.616 -.0459	p=.143 .6088	p=.709 .3071	p=.253 -.3265	p=.233 -.2867
B_anterior_R	p=.922 -.7100	p=.147 -.3386	p=.503 -.7056	p=.475 -.5399	p=.533 -.2755
B_temporal_R	p=.074 -.7985	p=.457 -.0937	p=.076 -.6330	p=.211 -.7556	p=.550 -.5790
B_central_R	p=.031 -.7099	p=.842 .1501	p=.127 -.4322	p=.049 -.7869	p=.173 -.6687
B_posterior_R	p=.074 -.6301	p=.748 -.0408	p=.333 -.4810	p=.036 -.6243	p=.100 -.4126
	p=.129	p=.931	p=.274	p=.134	p=.358

	FAT MASS	LEAN MASS	BODY MASS	FAT MASS (%)	BMI pct
D_anterior_L	p=.407 -.3751	p=.831 -.0999	p=.472 -.3286	p=.535 -.2855	p=.758 .1438
D_temporal_L	p=.745 -.1521	p=.851 -.0879	p=.732 -.1597	p=.888 -.0661	p=.491 .3153
D_central_L	p=.078 -.7028	p=.741 .1543	p=.342 -.4248	p=.058 -.7391	p=.220 -.5313
D_posterior_L	p=.483 -.3205	p=.902 -.0576	p=.565 -.2652	p=.574 -.2598	p=.888 .0662
T_anterior_L	p=.704 -.1770	p=.119 .6430	p=.618 .2309	p=.345 -.4222	p=.629 -.2244
T_temporal_L	p=.679 -.1924	p=.239 .5134	p=.753 .1472	p=.372 -.4016	p=.859 -.0834
T_central_L	p=.185 -.5665	p=.237 .5147	p=.791 -.1241	p=.035 -.7878	p=.093 -.6792
T_posterior_L	p=.373 -.4007	p=.344 .4235	p=.907 -.0546	p=.168 -.5842	p=.509 -.3031
A_anterior_L	p=.504 -.3066	p=.249 -.5041	p=.248 -.5048	p=.937 -.0370	p=.696 .1820
A_temporal_L	p=.943 .0336	p=.105 .6630	p=.380 .3952	p=.577 -.2576	p=.788 -.1257
A_central_L	p=.436 -.3541	p=.285 .4717	p=.989 .0062	p=.190 -.5612	p=.108 -.6577
A_posterior_L	p=.683 -.1901	p=.577 .2578	p=.990 .0059	p=.505 -.3053	p=.557 -.2705
B_anterior_L	p=.266 -.4888	p=.434 -.3555	p=.197 -.5542	p=.513 -.3002	p=.910 .0529
B_temporal_L	p=.195 -.5561	p=.745 -.1520	p=.265 -.4893	p=.277 -.4792	p=.677 -.1940
B_central_L	p=.026 -.8148	p=.823 .1051	p=.217 -.5337	p=.013 -.8584	p=.084 -.6930
B_posterior_L	p=.122 -.6388	p=.860 -.0825	p=.242 -.5107	p=.147 -.6090	p=.404 -.3775

SUMMARY

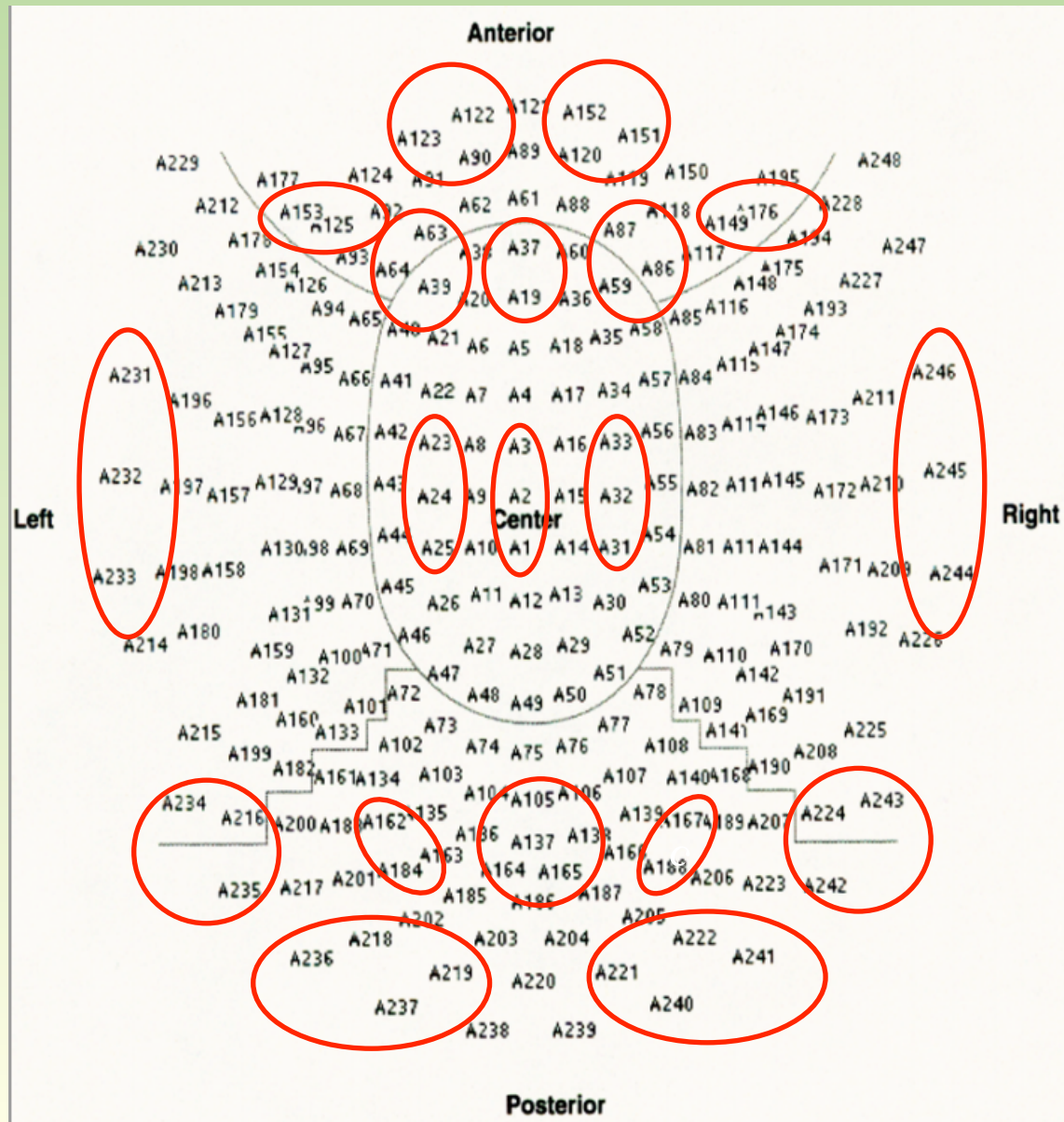
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D_central_L	.7201 p=.044	.5467 p=.161	.2329 p=.615	.7726 p=.025	.6953 p=.056	.7707 p=.025
D_posterior_L	.7334 p=.038	.6009 p=.115	.0740 p=.875	.8744 p=.004	.6683 p=.070	.8228 p=.012
T_anterior_L	.7749 p=.024	.6332 p=.092	.8146 p=.026	.7911 p=.019	.6855 p=.061	.7783 p=.023
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A_temporal_L	.6056 p=.112	.5493 p=.158	.8315 p=.020	.6904 p=.058	.4202 p=.300	.6050 p=.112

Baseline spectral frequency distributions of electroencephalograms (EEGs) has revealed increased activation in the **theta, alpha and beta** spectral bands, and higher mean frequency in the **delta, theta and beta** bands in more active or aerobically fit individuals.

(Bashore 1989, Dustman et al. 1985, 1990, Lardon & Polich 1996)

FUTURE



CONCLUSIONS

- Imaging studies require lot of patience, time and effort
- It is very easy to “lose” sample size due to artifact etc.
- Our results are very promising, we will be able to challenge papers published in high IF journals
- The research area is still new, there is a lot that has to/can be done
- The topic is “hot”

Advantages/availabilities:

- Most inactive state
- Very obese state
- Special population
- Unique cohort study with extensive cognitive measures

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Dr. Shalini Narayana

Dr. Marion Hare

Dr. Fred Palmer

Dr. Sunny Anand

Dr. Jeff Sable



MEG II Summary

- 8 subjects
- 6 subjects with brain recording
- Current analytical strategies:
 - Relationship between resting brain activity (e.g. FFT) and stress levels (cortisol from saliva)
 - Differentiation between developmentally delayed and normally developing children, using FFT
 - Parallel investigation of neurophysiological markers unique to developmentally delayed and normally developing children using novel **functional connectivity analysis**



Also, it provides an opportunity to establish, cross-sectional, normative profiles of connectivity which at present is lacking in the literature.

