

NEUROVASCULARIZATION AND TRACTOGRAPHY IN OBESE CHILDREN

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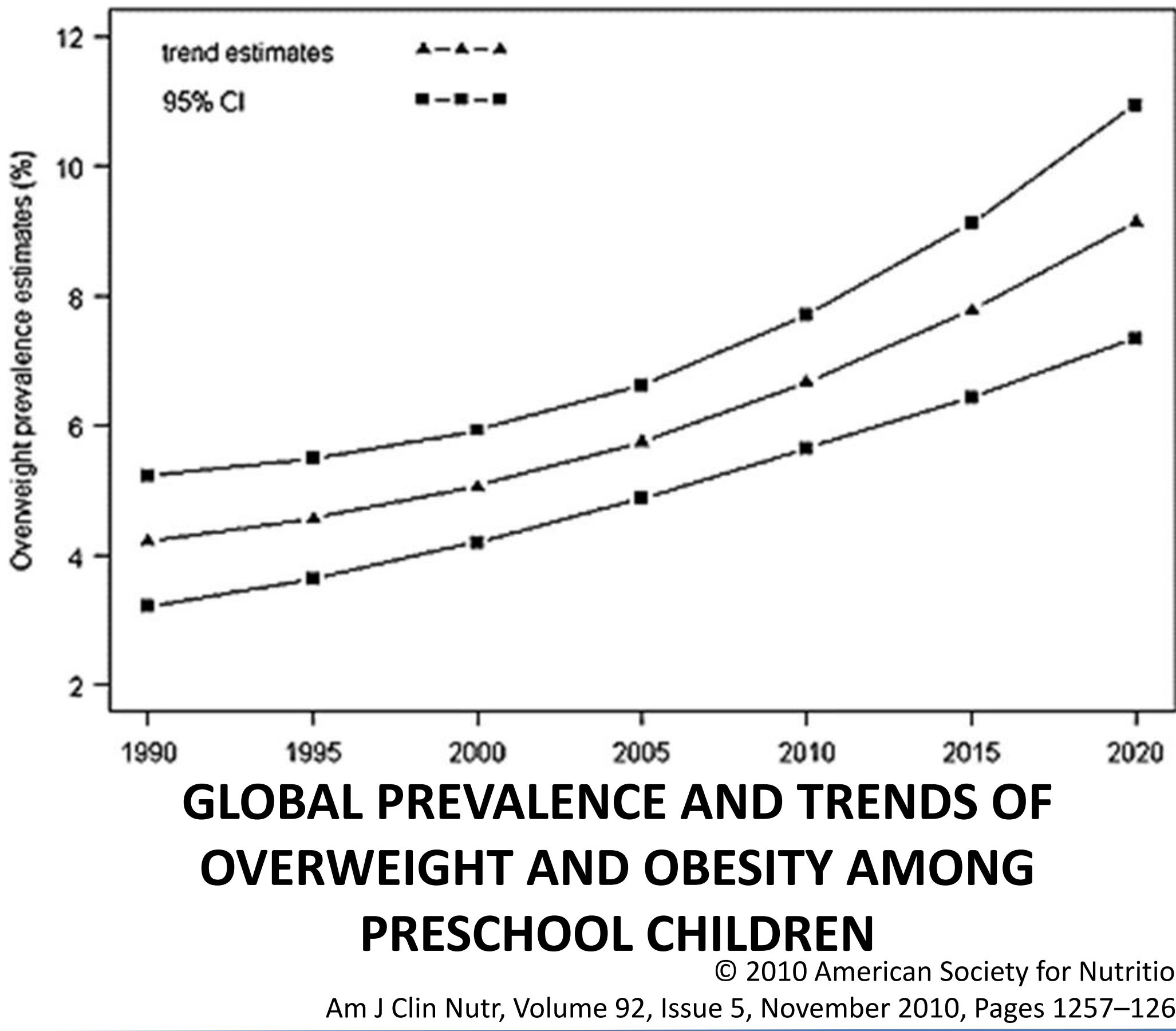


Background:

In the WHO European Region

1 in 3
11-year-olds is
overweight
or
obese

WHO European Region
www.euro.who.int/obesity



The aim: to analyze the association of cognitive functions and childhood obesity with differences in the structure of white matter and neurovascularization.

MAGNETIC RESONANCE IMAGING

Contrast less perfusion

MR-tractography

NEUROPSYCHOLOGICAL TESTING

Raven's Progressive Matrices

Intelligence quotient (IQ)

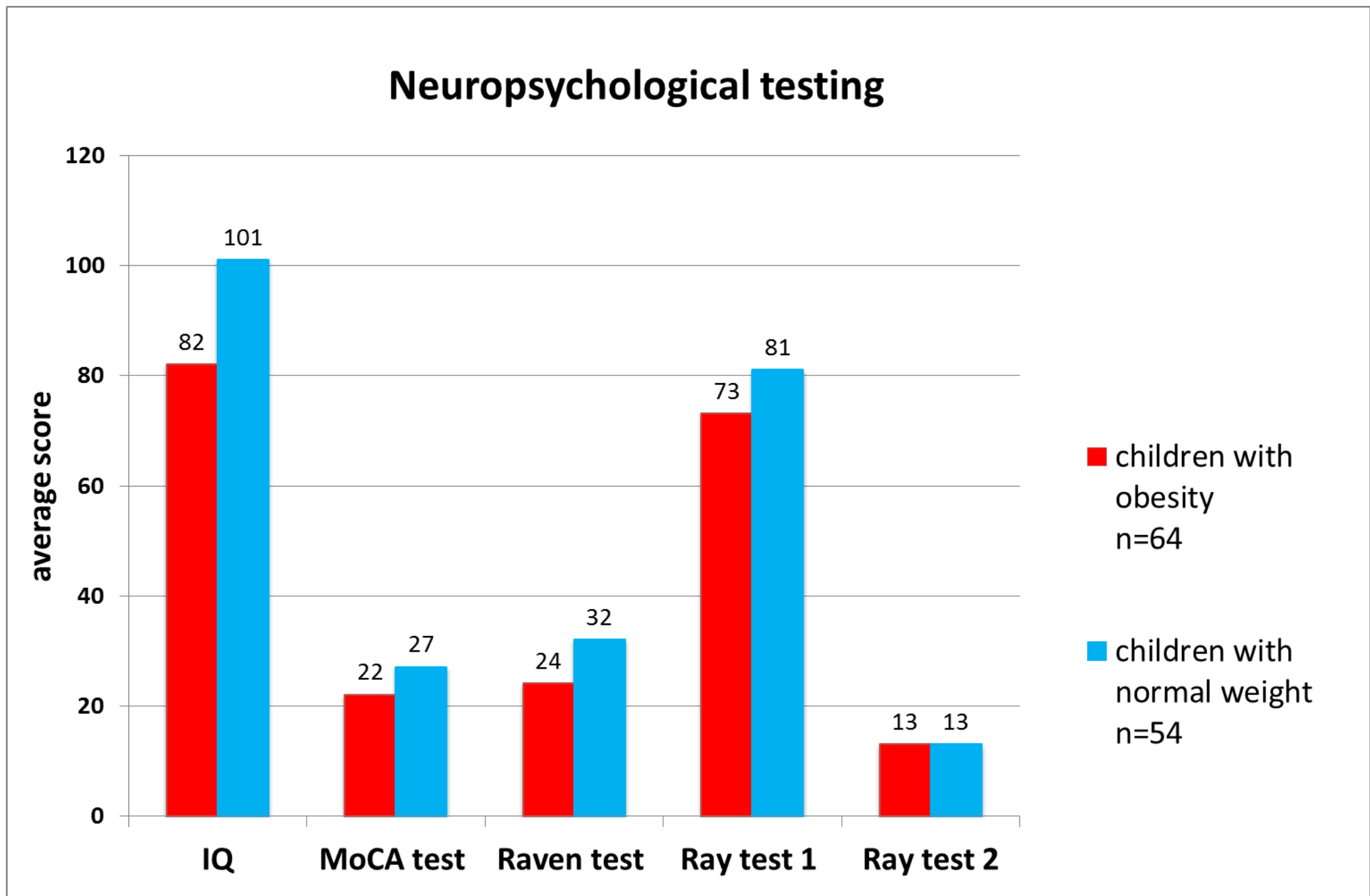
Montreal Cognitive Assessment (MoCa)

Ray test (1 and 2 versions)

Materials and methods:

	AVERAGE AGE	♀:♂	AVERAGE WEIGHT (KG)	AVERAGE HEIGHT (M)	AVERAGE SDS	AVERAGE BMI (KG M ²)
Group 1 children with obesity (n=64)	14	32:32	63.75	1.705	2.8	27.3
Group 2 normal weight (n=54)		27:27	41.1	1.49	0.4	18.4

Results:

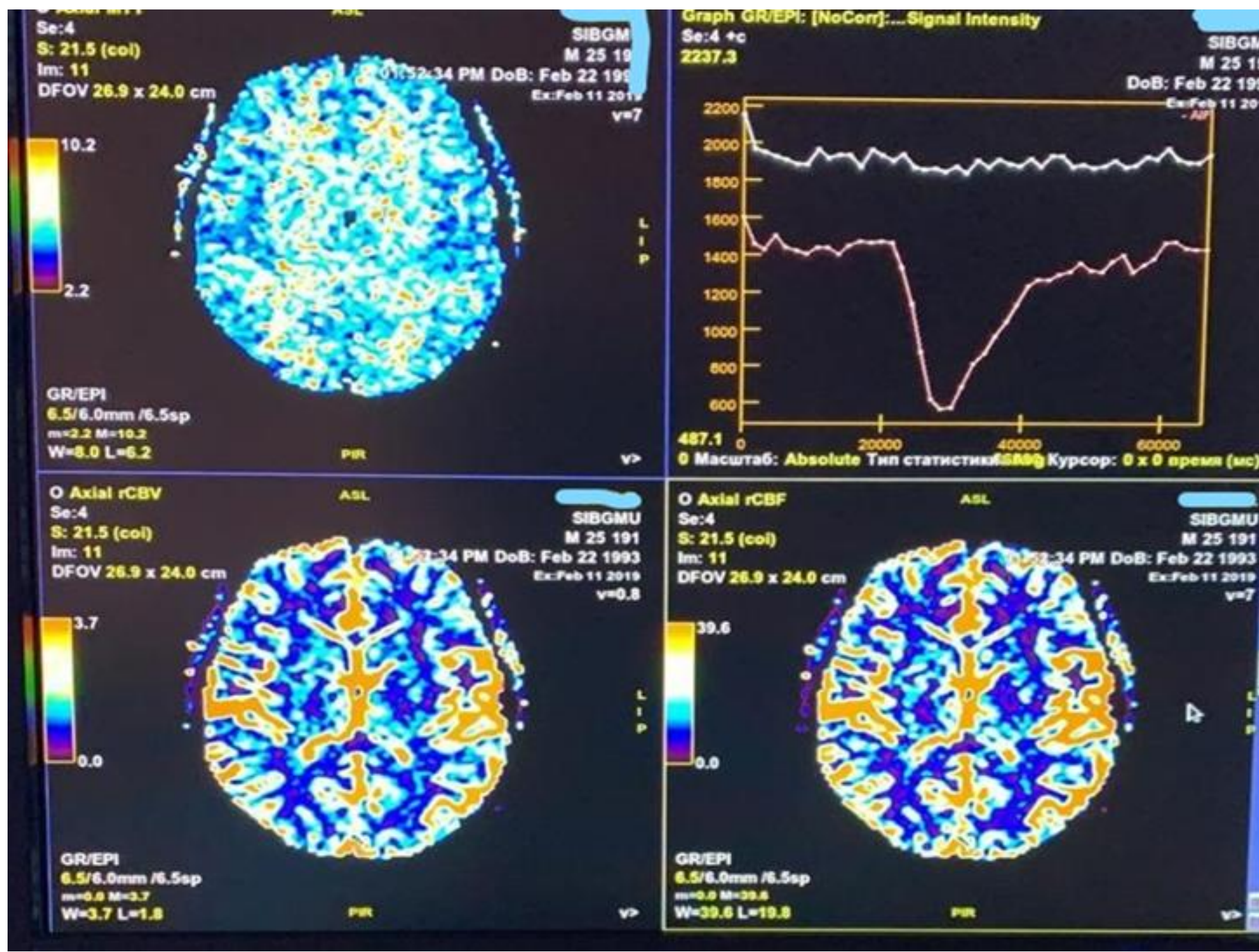


- Decrease in scores on the MoCA and Raven's tests, as well as IQ in obese adolescents ($p \leq 0.05$).
- In the two groups according to version 1 of the Ray test ($p \leq 0.05$).
- In the version 2 of the Ray test, the variants of the groups were comparable.

	SDS	BMI (kg/m2)	degree of obesity	PL GMR	PL GML	PL WMR	OL WMR	OL WM L	TL GMR	TL GML	TL WMR	TL WM L	Amy R	Amy L	GP R	GP L	SFL R	SFL L	UFR	UFL	Ray test 2	Ray test 1	MoCa test	Raven test	IQ	
SDS	1.000	0.747	0.949	0.537	0.188	0.064	0.042	-0.097	-0.055	0.352	0.080	0.060	-0.381	-0.138	-0.151	0.00	0.231	-0.041	-0.253	-0.082	-0.383	-0.178	-0.287	-0.233	-0.270	
BMI (kg/m2)	0.747	1.000	0.712	0.361	0.075	-0.026	-0.050	-0.173	-0.108	0.231	0.060	-0.104	-0.233	-0.019	-0.242	-0.295	-0.025	0.194	-0.129	-0.129	-0.126	0.018	-0.313	-0.236	-0.354	
degree of obesity	0.949	0.712	1.000	0.459	0.038	-0.141	-0.065	-0.027	-0.069	0.403	0.083	0.045	0.000	-0.417	-0.061	-0.108	0.098	0.330	-0.021	-0.218	-0.034	-0.461	-0.163	-0.273	-0.209	
PL GMR	0.537	0.361	0.459	1.000	0.385	0.137	0.222	0.069	-0.115	0.064	0.158	0.429	0.153	-0.168	0.044	0.076	0.015	0.275	0.057	0.045	0.019	-0.328	-0.149	-0.335	-0.374	
PL GML	0.188	0.075	0.038	0.385	1.000	0.320	0.235	0.312	0.202	-0.171	0.158	0.068	0.066	-0.017	-0.143	-0.137	0.009	0.322	0.085	0.053	0.034	0.068	-0.101	-0.006	-0.116	
PL WMR	-0.064	-0.026	-0.141	0.137	0.320	1.000	0.466	0.297	0.240	0.040	0.116	0.061	0.052	0.189	0.231	-0.179	0.066	0.900	0.349	0.157	0.059	0.053	0.094	-0.171	-0.284	
OL WM L	0.042	-0.050	-0.065	0.222	0.235	0.312	0.297	0.020	-0.171	0.158	0.068	0.330	0.188	-0.129	-0.103	0.182	-0.079	0.051	-0.022	-0.066	-0.035	-0.073	-0.334	-0.443	-0.322	
OL WMR	-0.097	-0.173	-0.027	0.069	0.312	0.297	0.020	1.000	0.599	-0.041	0.075	0.034	-0.125	-0.238	0.088	0.149	0.149	-0.090	-0.052	-0.047	0.117	0.035	0.147	0.094	-0.041	
TL WMR	-0.055	-0.108	-0.096	-0.115	0.202	0.240	0.142	0.599	1.000	-0.132	0.163	0.116	-0.128	-0.073	0.206	0.064	-0.155	-0.056	0.075	0.184	0.031	0.086	-0.033	-0.112	-0.192	
TL GMR	0.352	0.231	0.403	0.064	-0.171	0.040	-0.223	-0.081	-0.132	1.000	0.257	-0.097	-0.271	-0.159	0.046	-0.069	0.026	0.290	0.229	-0.022	0.177	-0.394	-0.039	-0.208	-0.096	
TL GML	0.080	0.060	0.060	0.083	0.158	0.176	0.116	0.086	0.075	0.163	0.257	1.000	0.087	0.367	0.053	0.127	0.397	0.218	0.221	-0.075	0.033	-0.036	0.155	-0.267	-0.351	
TL WMR	-0.060	-0.140	0.045	-0.429	0.158	0.061	0.030	0.044	0.116	-0.097	0.155	0.080	0.371	-0.171	-0.127	0.122	0.024	0.172	0.188	0.089	0.211	-0.217	-0.101	-0.250	-0.281	
TL WM L	-0.004	-0.233	0.000	0.153	0.088	0.052	0.188	-0.125	-0.128	-0.271	0.087	0.371	1.000	-0.009	0.110	0.164	0.281	0.026	0.002	0.044	0.131	0.168	0.042	0.006	-0.182	
Amy R	-0.381	-0.019	-0.017	-0.168	0.066	0.189	0.129	-0.238	-0.073	-0.159	-0.367	-0.171	-0.009	1.000	0.038	0.019	-0.039	0.098	0.067	-0.051	-0.063	0.162	-0.096	-0.052	0.088	
Amy L	-0.138	-0.061	-0.061	-0.168	0.066	0.189	0.129	-0.238	-0.073	-0.159	-0.367	-0.171	-0.009	0.038	1.000	-0.105	0.167	-0.187	0.035	0.072	0.175	-0.185	-0.082	-0.137	-0.157	
GP R	-0.151	-0.295	-0.108	0.076	0.143	-0.170	-0.103	0.149	0.064	-0.069	0.122	0.397	0.164	0.019	1.000	0.186	0.093	0.011	0.066	0.020	0.066	0.213	-0.069	-0.112	-0.025	
GP L	0.010	-0.025	0.098	0.015	-0.137	0.066	0.182	0.149	0.155	-0.026	0.387	0.024	0.281	-0.039	0.167	1.000	-0.126	-0.320	0.056	0.003	0.168	0.361	-0.141	-0.235	-0.195	
SFL R	0.231	0.194	-0.129	-0.129	-0.108	-0.264	0.018	-0.313	-0.236	-0.354	-0.381	-0.019	-0.242	-0.295	-0.025	1.000	0.497	0.275	0.399	-0.149	-0.347	-0.155	-0.264	-0.302	-0.405	
SFL L	-0.041	-0.129	-0.129	-0.108	-0.264	0.018	-0.313	-0.236	-0.354	-0.381	-0.019	-0.242	-0.295	-0.025	0.497	1.000	0.497	0.275	0.399	-0.149	-0.347	-0.155	-0.264	-0.302	-0.405	
UFR	-0.021	-0.218	-0.034	-0.044	-0.163	-0.273	-0.209	-0.294	-0.334	-0.443	-0.322	-0.010	-0.006	0.116	0.082	-0.253	1.000	0.792	0.093	-0.104	-0.077	-0.103	-0.104	-0.077	-0.111	
UFL	-0.082	-0.129	-0.218	-0.045	-0.085	0.157	-0.022	-0.066	-0.035	-0.073	-0.334	-0.443	-0.322	-0.010	0.116	0.082	-0.253	1.000	0.792	0.093	-0.104	-0.077	-0.103	-0.104	-0.077	
Ray test 2	-0.383	-0.264	-0.461	-0.328	0.034	-0.035	0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	
Ray test 1	-0.178	0.018	-0.163	-0.149	0.068	0.094	-0.073	0.147	0.086	-0.039	0.155	-0.101	0.042	-0.096	-0.082	0.213	0.361	-0.347	0.051	-0.104	-0.118	0.463	1.000	0.919	0.817	
MoCa test	-0.287	-0.313	-0.273	-0.335	-0.010	-0.171	-0.334	0.049	-0.033	-0.208	-0.267	-0.250	0.006	0.052	-0.137	-0.069	-0.141	-0.155	-0.147	0.007	-0.067	0.627	0.155	1.000	0.919	
Raven test	-0.233	-0.236	-0.209	-0.374	-0.006	-0.284	-0.443	0.041	-0.112	-0.096	-0.261	-0.315	-0.182	0.088	-0.157	-0.112	-0.235	-0.264	-0.185	-0.111	-0.104	0.408	0.119	0.919	1.000	
IQ	-0.270	-0.354	-0.294	-0.115	0.116	-0.257	-0.322	-0.046	-0.192	-0.380	-0.284	-0.171	0.059	0.079	-0.033	-0.025	-0.195	-0.302	-0.245	-0.139	-0.096	0.453	0.114	0.817	0.786	1.000

CORRELATION MATRIX OF BRAIN CHANGES WITH NEUROPSYCHOLOGICAL SCALES IN CHILDREN WITH OBESITY ($P \leq 0.05$).

- Perfusion analysis: changes in vascularization in the left areas of the white matter reduction of perfusion in the occipital lobe and its increase in the temporal lobe area.
- MR- tractography of the white matter: a decrease in fractional anisotropy in the area of the hook-shaped beam on the right and left, and in the anterior and posterior adhesive pathways.



BRAIN PERFUSION WITHOUT CONTRAST ENHANCEMENT IN CHILDREN WITH OBESITY

Conclusions: children with obesity had a violation of the integrity of the white matter and neurovascularization of the brain, which were associated with a deficiency of cognitive functions.