

The Trade-off between Olfactory Bulb and Eyeball Volume at Early Pubertal Onset

Murat Karaoglan, Hale Colakoğlu Er

Department of Pediatric Endocrinology, Gaziantep University Faculty of Medicine

Abstract

Context: Olfactory bulb (OB) and eyeball size change depending on age and puberty. There is well-established trade-off between sensory structures of brain such as eye and olfactory bulb depend on environmental circumstances in evolutionary history of animals.

Objective: The aim of this study is to developmentally investigate the potential reciprocal changes between OB and eyeball volumes (EV) in girls with precocious puberty (PP).

Design: A total of 148 girls aged between 5-8 years (63 PP, 85 healthy) were included in the study. Exclusion criteria: Cases of anosmia/hyposmia, neurodegenerative disorder, refractive errors and trauma. The pituitary height (PH), EV and OB volume were measured on segmentation of magnetic resonance image slice using manual counterung. The corrected measurements by body surface were used in all statistical analyzes.

Results:

In girls with PP, the means of OB volume and pituitary height (PH) were larger ($71.11 \pm 20.64 \text{ml}$) and higher ($4.62 \pm 1.18 \text{mm}$), respectively, while mean of EVs was smaller ($11.24 \pm 2.62 \text{cm}^3$) ($p=0.000$). Cut-off values were 62.27ml , 10.7cm^3 and 4.71mm for OB volume, EV and PH, respectively. While the negative correlations were found between OB volume-EV and EV-PH ($r_{63} = -0.224$, $p=0.001$ and $r_{63} = -0.116$, $p=0.001$, respectively), OB volume was positively correlated with PH ($r_{63} = 0.578$, $p=0.001$).

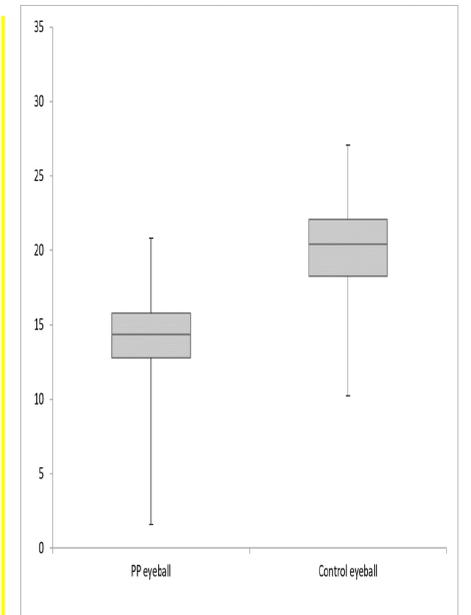
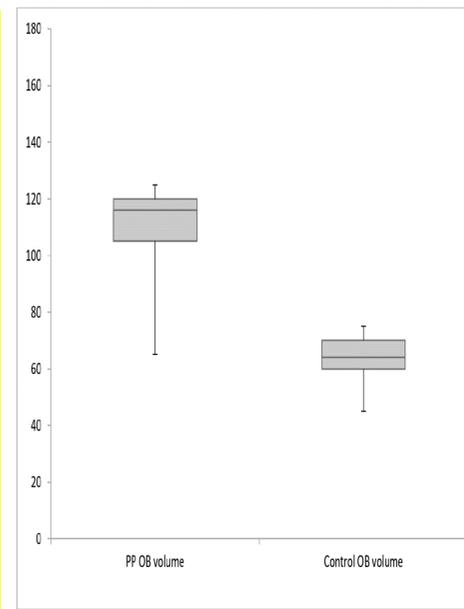


Table 4: Correlation between OB volume and eyeball volume and pituitary height in study and seperately for PP and control groups.

Correlations	PP r_{63}	P value	Control r_{85}	P value	Study r_{148}	P value
OB volume-Eyeball volume	-0.224	<0.001	0.412	<0.001	-0.408	<0.001
Pituitary height-Eyeball volume	-0.116	<0.001	0.438	<0.001	-0.438	<0.001
OB volume-Pituitary height	0.578	<0.001	0.245	<0.001	0.618	<0.001

Table 2: The mean of age heigth BMI body surface, olfactory bulb volume and pituitary heigth in precocious puberty and control groups.

	PP Group (n=63) Mean SD	Control Group (n=85) Mean SD	p
Age (year)	7.73±0.46	7.54±0.69	0.124
Height (cm)	130.55±8.03	122.54±11.28	0.0001*
Weight (kg)	30.29±6.82	26.42±9.92	0.13
BMI	18.44±3.18	18.28±5.88	0.964
Body surface (m ²)	1.07±0.16	0.93±0.25	0.0003*
Total OB volume (mm ³)*	71.11±20.64	48.36±11.82	0.000*
Right OB volume (mm ³)*	37.05±8.71	22.20±5.56	0.000*
Left OB volume (mm ³)*	36.6±8.65	21.69±5.22	0.000*
Pituitary height (mm)*	4.62±1.18	3.35±0.85	0.000*
Right OB-Left OB (mm ³)*	1.52±1.87	0.75±1.67	0.03

* Corrected values by body surface OB: olfactory bulb BMI: body mass index

Conclusion:

The present study demonstrates that girls with PP have significantly larger OB volume, but smaller EV, and there is negative correlation between two structures. These results indicate that there is trade-off between anatomical dimensions of OB and eyeball in favor of OB in PP girls.

Keywords: trade-off, olfactory bulb, eyeball volume, pituitary height, precocious puberty