

BIRTH WEIGHT AND THEIR INTERRELATIONSHIPS WITH LATER NUTRITIONAL STATUS, COGNITION AND SCHOLASTIC ACHIEVEMENT

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Background and aims

Prenatal nutritional indicators such as birth weight, birth length head circumference at birth are considered of great importance for later nutritional status, cognition and scholastic achievement (SA) at school-age. The aim of this study was to assess the association of birth weight with later nutritional status and SA in the 2009 Quality Education Measurement System (SIMCE) and in the 2013 University Selection Test (PSU) both language (LSA) and mathematics (MSA).

Methods

From a representative, proportional and stratified sample of 1,353 school-age children, of both sexes, enrolled in the 5th grade of elementary school and in the 1st grade of high school in the Metropolitan Region of Chile in 2010, 814 of them reports their birth weights. Nutritional status was assessed through anthropometric parameters of Z-weight (Z-W), Z-height (Z-H) and Z-head circumference (Z-HC). Intellectual ability (IA) was measured by the Raven Progressive Matrices test and SA by the SIMCE 2009 and PSU 2013 tests. Data were analyzed using multiple regression analysis from the SAS software.

Results

Birth weight was positively and significantly correlated with Z-HC ($r = 0.219$, $p < 0.0001$; Figure 1), Z-H ($r = 0.190$, $p < 0.0001$), and Z-BMI ($r = 0.162$, $p < 0.0001$). Z-HC was the most important anthropometric indicator (of nutritional background and brain development) positively and significantly correlated with SIMCE outcomes at the end of elementary school and with PSU results, both LSA and MSA at the end of high school ($p < 0.0001$) and with IA ($p < 0.0001$) (Table 1).

Conclusions

These findings confirm that birth weight is significantly associated with later nutritional status, especially Z-HC and this with cognition at school-age.

Table 1

Pearson correlation coefficients between nutritional status and scholastic achievement both language (LSA) and mathematics (MSA) in the SIMCE 2009 and, PSU 2013 four years later and intellectual ability (IA)

Nutritional status measurements	SIMCE 2009		PSU 2013		IA
	LSA	MSA	LSA	MSA	
Postnatal nutritional background					
Z-HC	0.126***	0.228****	0.305****	0.371***	0.205****
Z-H	0.088*	0.090*	0.168**	0.214****	0.140****
Current nutritional status					
Z BMI	-0.049 NS	-0.036NS	0.021 NS	0.012 NS	0.033 NS

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; **** $P < 0.0001$; NS, not significantly different.

Figure 1

Association between birth weight and head circumference-for-age Z-score (Z-HC)

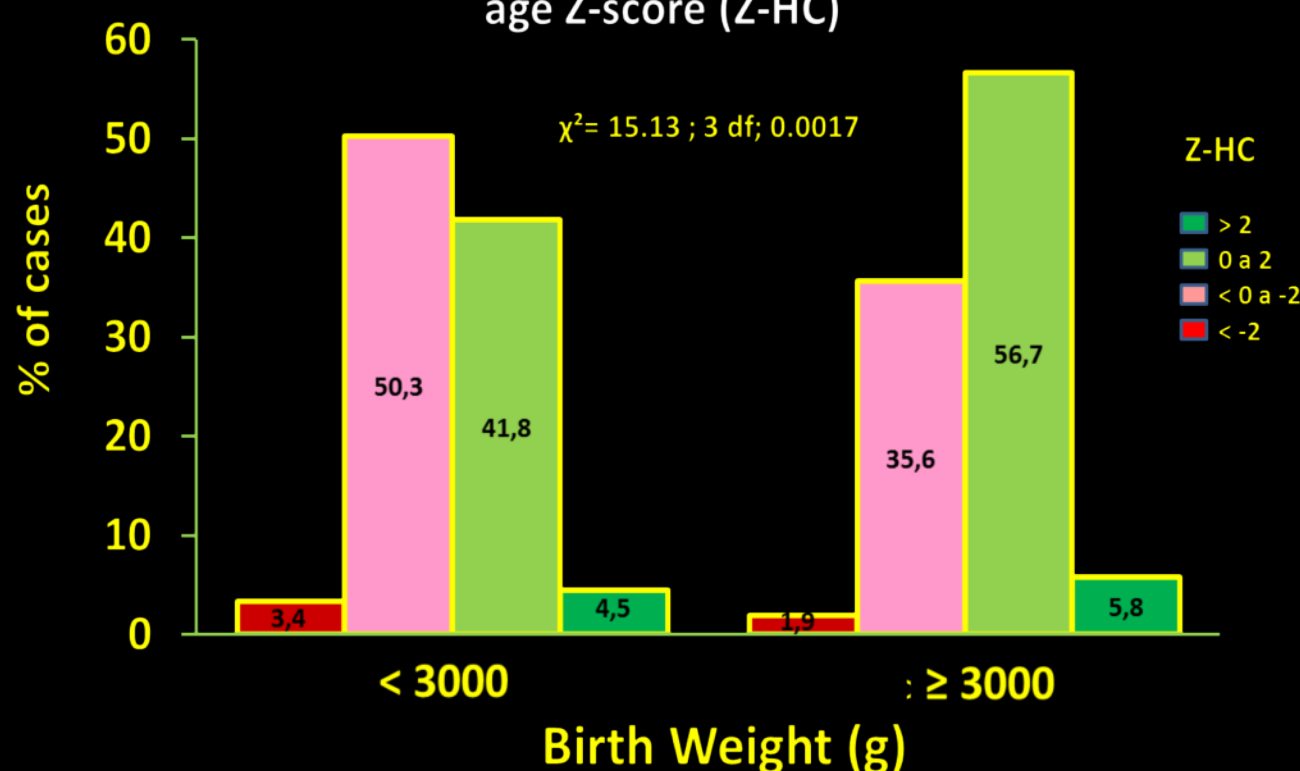


Table 2

Pearson correlation coefficients between intellectual ability (IA) and scholastic achievement both language (LSA) and mathematics (MSA) in the SIMCE 2009 and, PSU 2013 four years later.

IA	SIMCE 2009		PSU 2013	
	LSA	MSA	LSA	MSA
	0.447 ****	0.537 ****	0.473 ****	0.534 ****

**** $P < 0.0001$