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Anthropometric Studies of Schoolchildren During the First Decades of the 20th Century in Spain and Argentina

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ABSTRACT

Objective: The practice of anthropometry in schools at the beginning of the 20th century originated in Europe and Latin America in conjunction with the emergence of hygienism and epidemiological auxology. The aim of this work is to deepen the knowledge of these practices in Spain and Argentina and to compare the available growth data in order to identify possible differences between the populations.

Methods: The anthropometric data of 1693 boys and girls aged 7–15 years (877 Spanish; 816 Argentinean) from the period between 1903 and 1913 were analyzed. The data were taken from the Reports and Memoirs of the School Colonies of the National Pedagogical Museum (Spain) and the Archives of Pedagogy and Related Sciences of the Faculty of Law and Social Sciences of the National University of La Plata (UNLP) (Argentina).

Results: The most pronounced differences in weight and height were observed between the ages of 11 and 12. The weight growth of Spanish schoolchildren was 22% (boys) and 24% (girls) lower than that of their Argentine counterparts, while linear growth was about 7% lower for both sexes. In addition, the Spanish had a lower body mass index up to the age of 12 years.

Conclusions: Argentine boys and girls of La Plata were taller and heavier than their Spanish counterparts of Madrid during the same period (between 1903 and 1913). These results can be attributed to the higher standard of living that characterized the Argentine population at that time.

1 | Introduction

Growth is a dynamic and continuous process that occurs from the moment of conception to the attainment of adulthood. During this period, an individual increases in size modifies their proportions, and varies in its body composition (Bogin 2020). Phenotypic variation in human growth is a dual-component phenomenon in that its genetic basis is significantly influenced by environmental factors.

The existence of variations in human growth among different populations has been extensively discussed. Evidence suggests that average linear growth up to the onset of puberty is comparable in populations that experience favorable growth environments (Eveleth and Tanner 1990; Haas and Campirano 2006; Martorell and Habicht 1985; Ulijaszek 2001). Haas and Campirano (2006) investigated the variations in height attained by pre-adolescent and adolescent children across different countries. They compared 53 healthy, economically privileged

groups of children from non-European countries with those from Northern European countries. Their findings indicated that the latter tend to be 3–5 cm taller than the World Health Organization (WHO 2007) reference population, while the non-European children are approximately 5 cm shorter than the reference. Although the children included in this study were all considered to be relatively economically privileged, it has been suggested that the observed differences in growth may stem from inherent factors. However, other evidence indicates that these differences are likely of environmental origin, as variations in population height have been shown to decrease over time with increasing affluence (Navazo and Dahinten 2023; Orden 2023; Silva et al. 2023; Rosique Gracia, Montoya Granda, and García Pineda 2023).

The significance of the interplay between genetic and environmental factors is exemplified by Martínez-Carrión (2012), who conducted a comparative analysis of male height across 15 European countries from the 1870s to the 1980s. In line with improvements in quality of life, welfare, and nutrition during this period, all Europeans exhibited a notable increase in height; however, the observed differences between countries persisted. Consequently, the tallest populations were consistently those from Germany, Denmark, the Netherlands, and Norway, while the shortest were from Mediterranean countries such as Italy, Portugal, and Spain.

The analysis of growth variability in the Latin American context is interesting because it includes a very diverse population, with individuals of Native American, African, and European ancestry. Ruiz-Linares et al. (2014) analyzed the genomes of 7000 adults from Brazil, Chile, Colombia, Mexico, and Peru, and discussed the influence of genetic and environmental factors on height. The authors demonstrated that individuals with greater European ancestry exhibited a positive correlation with height, whereas those with lower socioeconomic status showed a negative correlation with this anthropometric variable. Recent studies on the anthropometric history of Latin America have provided valuable information on growth and its determinants, contributing to a better understanding of the socio-economic aspects of stature, inequality, and welfare in the region (López-Alonso 2024; Martínez-Carrión and Salvatore 2019). As these authors point out, a more historical analysis would help to deepen our knowledge of the context in which these processes evolved in different periods for different countries.

In line with this, Tanner stated that growth reflects the material and moral conditions of society and defined epidemiological auxology as the use of physical growth data to assess and define the health status of a society (Tanner 1981, 1987). Since growth is a basic aspect of infancy, childhood, youth, and adolescence, the school setting is the optimal location for epidemiological auxology research. The school population is an ideal sample population, consisting of boys and girls of the same age in different grades (homogeneous cohorts) in sufficient numbers to represent a significant sample. However, the implementation of anthropometry in schools was influenced by specific historical factors, with some similarities emerging in line with the growth of hygienism in Europe during the 19th century and its subsequent spread to many Latin American countries, including Argentina.

The hygienist movement addressed all aspects of the relationship between disease and society, establishing itself as a medical-social discipline. In line with this, the natural progression was the establishment of a tripartite alliance between medicine, hygiene, and the school. The school environment presented an ideal social space for the medical-hygienic care of children, particularly those deemed "weak, abnormal, or retarded." Moreover, the school provided an avenue for reaching families and, consequently, the adult population (Viñao 2010).

In Spain, in particular, the institutionalization of hygienism in education took place at the end of the 19th century. One of the main promoters of this development was the Institución Libre de Enseñanza (ILE), in which influential figures such as Ricardo Rubio (Rubio 1884), Francisco Giner de los Ríos (Giner 1892), Pedro de Alcántara García (Alcántara García 1886) and Luis Simarro (Simarro 1889) played a key role. In 1882, the ILE created the Museo de Instrucción Pública (MPN), which was later renamed the Museo Pedagógico Nacional (National Pedagogy Museum). The aim of the MPN was to deal with issues related to teaching, education, health, the growth and development of children, and the factors that enhance their intellectual and physical abilities. In the first third of the twentieth century, the hygienist movement gained considerable traction, advocating child protection, paidology, paidometry, scientific psychopedagogy, and the so-called "pedagogical anthropometry" (Blanco 1912; López Núñez 1908; Morros Sardá 1935; Pedrero Caballero 1907).

Following the European example, hygienism took hold in Argentina at the end of the 19th century. This included the medicalization of institutions, the organization and reform of hospitals, and the introduction of hygienic practices in schools, brothels, and tenements (collective housing). As outlined by Agüero, Milanino, and Bortz (2011), the foundations of the "school anthropometry" initiative were established in 1884 with the passing of Law 1420 on Common Education. This legislation led to the creation of a National Education Council, which subsequently created the School Medical Corps. The School Medical Corps was responsible for carrying out physical examinations of all schoolchildren between the ages of 6 and 14. The examination included the measurement of anthropometric variables (weight and height) and a review of the general state of health (muscle and bone development, language, vision, hearing, smell, etc.) to identify specific problems that might affect children's learning. However, historical records indicate that school anthropometric studies with a population perspective began in the early decades of the 20th century (Garrahan and Bettinotti 1922; Cassinelli 1916a, 1916b; Senet 1907).

The aim of this work is to enhance our understanding of anthropometric practices in Spanish and Argentinian schools at the turn of the 20th century. By comparing the available growth data, we aim to identify potential interpopulation differences.

2 | Material And Methods

The present study includes two distinct phases: a historical and documentary analysis, and a comparative analysis of growth data.

The comparative analysis of growth data is based on the first two decades of the 20th century. The sources used are the Reports and Memoirs of the school colonies of the National Pedagogical Museum (Spain) and the Archives of Pedagogy and Related Sciences of the Faculty of Legal and Social Sciences of the National University of La Plata (UNLP) (Argentina). The data provided in these texts includes the weight (W) and height (H) values of each schoolchild examined in the school colonies in Madrid, which were promoted by the ILE and by the Alumni Corporation of that organization (CAAILE), as well as in the schools of the UNLP of La Plata.

From these values, we calculated the body mass index [BMI = W(kg)/H(m)^2] and estimated descriptive statistical parameters [mean (M) and standard deviation (SD)] for each variable by sex, age, and country of origin.

Data analysis was carried out with SPSS v. 24. Interpopulation comparisons were performed using Student's *t*-tests for two independent samples. Likewise, to estimate the magnitude of the disparities, absolute differences (AD) and percentage differences ($D\%$) between means were calculated ($D\% = 100 \text{x} \times (\text{M1} - \text{M2})/\text{M1}$), with M1 being the mean of the variable analyzed in the Spanish population and M2 the mean of the same variable in the Argentine population. Finally, to gain a more comprehensive understanding of the variation in nutritional status across the series, it is essential to analyze the Z-scores for weight-for-age (WAZ), height-for-age (HAZ), and BMI-for-age (BAZ). The Z-scores have been estimated in relation to the WHO reference (WHO 2007) by applying the WHO AnthroPlus software (2009), which also allows a comparative graph of the distributions of the historical series analyzed versus the international reference.

3 | Results

3.1 | Historical and Documentary Análisis

3.1.1 | School Anthropometry in Spain: The Case of Vacation Camps in Madrid

The hygienist movement aimed to disseminate fundamental hygienic principles and modify inadequate living habits in the population. This movement was instrumental in the establishment of school vacation camps, which proved to be the most effective solution for addressing the issue of neglected children in society at the time. During this period, Spain was experiencing an unfavorable economic situation, resulting in thousands of children wandering through urban areas, facing challenges related to hunger, physical abuse, and illness (Rodríguez Pérez 2001).

In this context, the first school vacation camps with hygienic and pedagogical functions were organized (Otero Urtaza, Navarro Patón, and Basanta Camiño 2013; Rodríguez Pérez 2001). As stated by Manuel B. Cossío (the inaugural director of the MPN), the objective of these colonies was to provide care for children suffering from illness, tuberculosis, and particularly those facing challenges due to limited access to nutritious food and unhealthy living conditions (Cossío 1888). While the precise date of the school colonies in Spain remains uncertain, historical documentation indicates that the initial forays of schoolchildren into rural areas commenced prior to 1864. However, the formal establishment of these initiatives by the ILE and the MPN is attributed to 1887 (Rodríguez Pérez 2001).

The summer activities were meticulously planned, with teachers selected, schoolchildren chosen, and a program of activities to be carried out drawn up (Montero et al. 2000, 2018). In regard to the selection of the settlers, the teachers initially identified the most economically disadvantaged children in the public schools. These children came from working-class families, resided in unhealthy conditions, and were at risk of contracting diseases. The final selection of students was then made by the doctors. It should be noted that the ILE colonies were open to both sexes. Although men and women were housed in the same locality, they did not live together. They lived independently and were directed by different teachers (Salcedo y Ginestal 1900).

The colonies' primary objective was to enhance the physical well-being and intellectual capabilities of each child. To this end, comprehensive medical MPNs were conducted at the outset and conclusion of each stay, with the results documented in "anthropological sheets." The following aspects were included in the checks: Filiation: name of the settler, father and mother and their ages; Anatomical data: physical constitution and anthropometric measurements: weight, height, skull circumference and cephalic index, head, chest and belly diameters; Physiological data: dynamometry; number of inspirations and pulsations, anomalies, etc. (MPN 1907).

Data collected at the beginning and end of the colonies were then compared. Overall, the results showed that the stays were beneficial to the health of the participants, with positive changes observed in their physical condition. All relevant data were duly recorded in the Reports and Memories (MPN 1907). From 1887 to 1926, the institution set up by the ILE operated school vacation camps without interruption. The number of children attending each year varied greatly. Initially, around 20 schoolchildren participated, while from 1911 the number of colonists increased to 50 (Montero et al. 2018).

3.1.2 | Anthropometry of the School in Argentina: Hygienism, Sanitarianism, and Eugenics in the Field of Education

Since the Argentine educational system was founded, school hygiene has played an important role. In 1886, the National Board of Education, under the direction of Benjamín Zorrilla, enacted the first regulation of the School Medical Corps. Among other things, this legislation mandated that school physicians should be responsible for the hygienic inspection of educational facilities and gym equipment, the preparation of reports, and the writing of hygienic guides for school directors.

In the early decades of the 20th century, the core discourses of eugenics, hygienism, and sanitarianism proliferated in the school environment, particularly in normal schools where future teachers were trained. This was under the aegis of pedagogical positivism, which sought to impose regulatory practices on behaviors, both group and individual. In this way, the school contributed to the process of symbolic construction of healthy

bodies (Lionetti 2011), as it was believed that "social complexities" could be diagnosed through the study, quantification, and measurement of future citizens (Cammarota 2016).

The assumption that "weak bodies" had a detrimental impact on the formation of an idealized nation led to the establishment of primary and secondary schools as the optimal setting for classifying the student population based on the criterion of "biological and psychological normality" (Cammarota 2016). An example of this was the incorporation of anthropometric, behavioral, and psychological data into school records with the objective of classifying, ordering, and hierarchizing schoolchildren. This approach was based on the assumption that there would be discernible indications in the children's bodies that would reflect their moral condition and social status (Palma 2008).

In the primary and secondary academic environments of the National University of La Plata (UNLP), pedagogues and researchers such as Victor Mercante, Rodolfo Senet, and Alberto Picco proposed different types of records, forms of classification, evaluation, and selection of students through the application of anthropometric and craniometric techniques (Mercante 1906; Picco 1910; Senet 1907). For the purposes of this project, we will be referencing Senet's study, "Anthropological research: The statistical data on height, trunk, arm span, lower extremities, and weight by age and gender" which is of particular interest, as it provides a comprehensive anthropometric profile of school-aged children (6–18 years) of both sexes from various pre-university institutions affiliated with the UNLP (Senet 1907).

The title of this work reflects a positivist and scientistic approach, as evidenced by its reference to the term "statistics," which is intended to convey a methodological quality. While the author's analyses may appear somewhat rudimentary from a modern perspective, they demonstrate the growing importance of scientific knowledge in the school environment at the time.

In his 1907 publication, Senet stated that "Immediate application of his conclusions to the school environment, from various perspectives, particularly in regard to physical education and student hygiene, will provide the necessary stability for school organization from an evolutionary standpoint" (28). This sentence demonstrates the direct correlation between his work and the fields of hygienism, science, and education. It also illustrates the government's commitment to promoting healthy bodies, which is essential for developing model citizens (Palma 2008).

The author concluded by presenting the results in two parts. The first section of the paper presents the primary growth data, including weight, height, trunk and head length, and arm span. These data have been tabulated by age, sex, school, and grade and referenced with an identifying number and school initials. The second section of the paper presents some descriptive statistical analyses of the population studied and comparisons with data available for European and North American populations. These comparisons show that the population of La Plata had larger sizes than their foreign counterparts. Senet's narrative aligns with his bioanthropological interest, emphasizing that the variability observed in the growth of Argentine and European schoolchildren is influenced by a combination of genetics and environmental factors. He asserts that nutrition plays a pivotal role in ensuring optimal development. In this regard, he noted that inadequate nutrition hinders the ontogenetic process and prevents individuals from reaching their full growth potential.

3.2 | Comparative Analysis of the Weight and Height of Spanish and Argentine Schoolchildren

The data used for the comparative analysis of growth between Spanish and Argentine schoolchildren were obtained from two sources: the Reports and Memoirs of the school colonies of the MPN carried out between 1903 and 1913 (corresponding to those registered at the beginning of the colonies) and the work of Senet (1907).

The data on weight, height, and BMI were compared for 1693 schoolchildren of both sexes aged 7–15 years (see Table 1).

Tables 2 and 3, corresponding to boys and girls, respectively, show the mean values and standard deviations of the variables analyzed by age and country of origin. It is evident that, in both sexes and at all ages, the values corresponding to weight and height are consistently higher in Argentine schoolchildren, with significant differences between countries. In contrast, this trend was not as pronounced for BMI, which showed significant differences up to 10 years of age in boys and 11 years of age in girls, after which the differences were not significant.

The discrepancies in weight and height between Spanish and Argentine schoolchildren are more evident when examining the average growth curves (Figures 1 and 2). The mean weight of Argentine males up to the age of 11 was found to be between 4.5 and 6 kg greater than that of their Spanish counterparts. From that age onwards, the differences were more pronounced, reaching 14 kg more. The female sample exhibited a similar trend, albeit with smaller AD, weighing between 8 and 11 kg more after 11 years of age (Figure 1).

TABLE 1 | Sample composition. Number of schoolchildren from Spain and Argentina distributed by sex and age.

Age	Spain			Argentina		
(years)	Boys	Girls	Total	Boys	Girls	Total
7	16	8	24	16	32	48
8	33	16	49	24	41	65
9	53	35	88	26	44	70
10	67	48	115	41	38	79
11	94	41	135	38	32	70
12	99	68	167	64	50	114
13	89	65	154	82	57	139
14	62	43	105	75	44	119
15	22	18	40	74	38	112
Total	535	342	877	440	376	816

Source: Own elaboration.

TABLE 2 | Mean and standard deviation of weight, height, and body mass index by age and country of origin in boys.

Age (years)	Weight (kg)					Height (cm)					BMI (kg/m^2)				
	Spain		Argentina			Spain		Argentina			Spain		Argentina		
	Mean	SD	Mean	SD	*p*	Mean	SD	Mean	SD	*p*	Mean	SD	Mean	SD	*p*
7	17.8	0.6	22.2	0.5	<0.001	110.1	1.4	111.9	0.8	<0.001	13.2	3.2	15.5	1.1	0.013
8	20.0	0.4	24.8	0.9	<0.001	115.3	1.0	124.3	1.3	<0.001	14.1	2.6	15.9	1.5	0.003
9	22.9	0.5	28.3	0.5	<0.001	122.4	1.4	131.1	0.8	<0.001	15.3	2.3	16.5	1.3	0.017
10	24.6	0.4	30.4	0.6	<0.001	125.7	0.8	133.9	0.8	<0.001	15.7	3.3	16.9	1.6	0.030
11	26.3	0.4	32.4	1.0	<0.001	129.8	0.8	138.6	1.1	<0.001	15.9	3.3	16.8	2.1	0.124
12	28.9	0.5	38.1	0.9	<0.001	133.6	0.7	145.5	0.9	<0.001	17.0	4.2	17.9	2.1	0.101
13	32.3	0.7	42.4	1.0	<0.001	138.2	0.9	150.2	1.0	<0.001	17.9	4.5	18.6	2.4	0.202
14	35.4	0.9	48.1	1.0	<0.001	143.8	1.3	155.4	1.2	<0.001	19.4	5.3	19.8	2.3	0.546
15	40.9	1.5	54.7	0.8	<0.001	151.7	1.9	162.9	0.8	<0.001	20.9	6.3	20.6	1.7	0.716

Note: Interpopulation comparisons by Student's *t*-tests for two independent samples.
Abbreviations: BMI, body mass index; SD, standard deviation.
Source: Own elaboration.

TABLE 3 | Mean and standard deviation of weight, height, and body mass index by age and country of origin in girls.

Age (years)	Weight (Kg)					Height (cm)					BMI (kg/m^2)				
	Spain		Argentina			Spain		Argentina			Spain		Argentina		
	Mean	SD	Mean	SD	*p*	Mean	SD	Mean	SD	*p*	Mean	SD	Mean	SD	*p*
7	18.3	0.7	22.5	0.5	<0.001	112.3	2.0	119.0	1.0	0.004	12.6	2.5	15.8	1.0	<0.001
8	19.2	0.4	25.0	0.5	<0.001	114.4	1.1	123.3	0.7	<0.001	13.2	2.2	16.4	1.6	<0.001
9	21.1	0.4	27.0	0.6	<0.001	119.1	0.9	128.5	0.9	<0.001	14.3	1.9	16.3	1.9	<0.001
10	23.7	0.4	30.9	0.9	<0.001	125.0	0.9	133.9	1.1	<0.001	15.2	3.0	17.1	1.8	0.001
11	25.8	0.6	34.4	1.0	<0.001	128.8	0.9	139.7	1.2	<0.001	15.0	2.3	17.5	2.3	<0.001
12	29.6	0.6	37.5	0.9	<0.001	135.3	0.8	145.9	1.0	<0.001	16.6	3.1	17.5	1.9	0.073
13	34.6	0.8	43.6	1.2	<0.001	142.4	1.0	151.3	0.9	<0.001	19.4	5.0	19.0	3.2	0.573
14	36.9	0.8	46.9	1.1	<0.001	145.8	1.0	153.2	0.8	<0.001	20.9	5.0	20.0	3.0	0.311
15	38.7	0.9	49.9	1.4	<0.001	147.3	1.1	156.6	0.8	<0.001	19.8	4.0	20.3	3.1	0.594

Note: Interpopulation comparisons by Student's *t*-tests for two independent samples.
Abbreviations: BMI, body mass index; SD, standard deviation.
Source: Own elaboration.

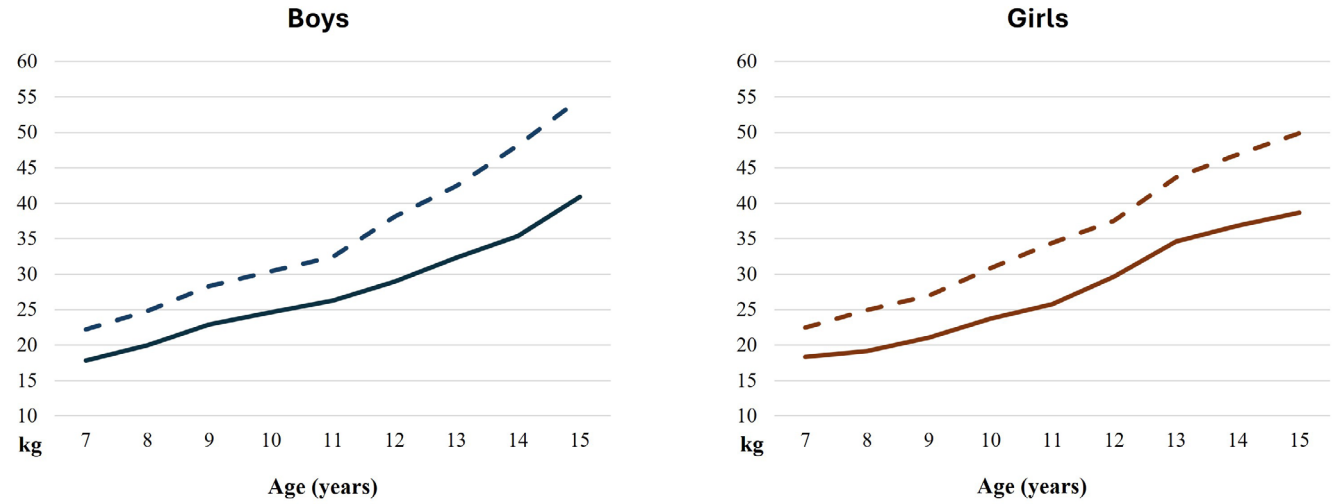

FIGURE 1 | Average weight growth curves of Spanish (solid line) and Argentinean schoolchildren (dashed line). *Source:* Own elaboration.

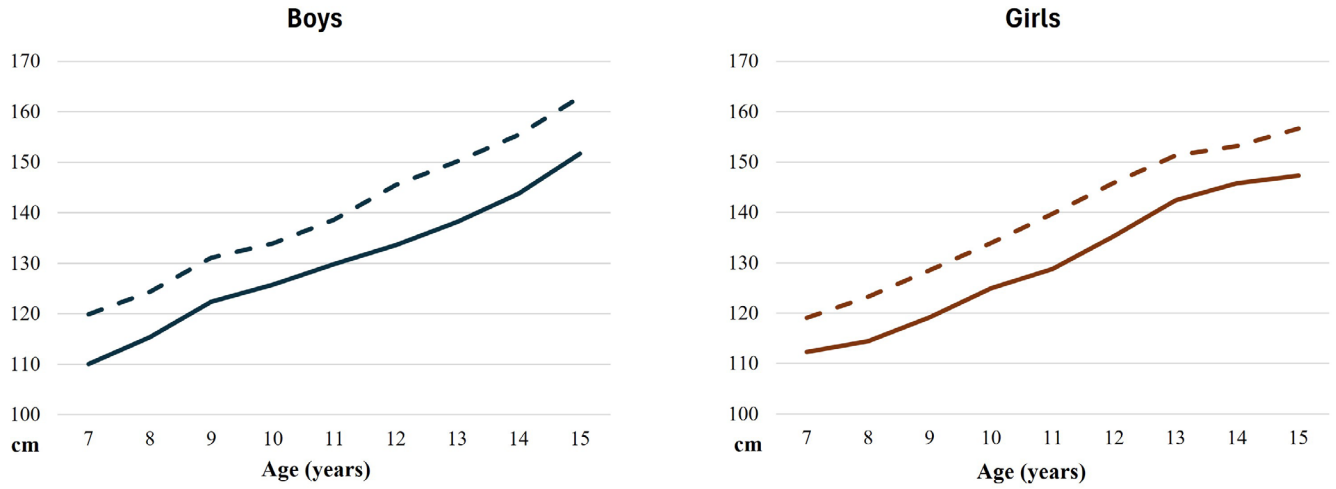

FIGURE 2 | Average height growth curves of Spanish (solid line) and Argentinean schoolchildren (dashed line). *Source:* Own elaboration.

It is noteworthy that interpopulation differences in height were evident for both boys and girls at all ages. For boys, the largest differences were observed at age 11 (about 12 cm) and for girls at ages 10 and 11 (about 11 cm) (Figure 2). The differences observed in weight were more pronounced than those in height. While the weight growth of Spanish schoolchildren was about 22% (males) and 24% (females) lower than that of their Argentine counterparts, linear growth was reduced by about 7% in both sexes.

Conversely, although the BMI of Spanish schoolchildren was generally lower, the differences between the populations decreased from 10 to 11 years of age. Even in some age groups, the European sample showed higher values than the Argentine sample (Figure 3).

Table 4 shows the mean values of HAZ, WAZ, and BAZ of the Spanish and Argentinean historical series. It should be noted that the WHO references do not provide values for weight-for-age from the age of 10 years, although they do provide values for BMI-for-age up to the age of 19 years. It was observed that the Argentine series (including both sexes) showed mean values for WAZ ($-0.37 \leq Z \leq 0.01$), HAZ ($-1.05 \leq Z \leq -0.19$), and BAZ ($-0.26 \leq Z \leq 0.27$) scores close to those of the international reference. In contrast, the Spanish series showed notably lower Z-scores: WAZ ($-2.02 \leq Z \leq -1.41$, HAZ: $-2.52 \leq Z \leq -1.55$) and BAZ ($-1.18 \leq Z \leq -0.60$). Figures 4 and 5 provide a more detailed illustration of this discrepancy. It plots the distributions of both historical series against the current WHO (2007) reference. While the Spanish sample is noticeable to the left of the reference, reaching values close to −4 Z scores for the WAZ and HAZ (Figure 4), the Argentinean sample aligns closely with the international pattern (Figure 5).

4 | Discussion

Although there were some differences between Spain and Argentina, in the late nineteenth and early twentieth centuries, schools were seen as crucial institutions for the formation of nation-states or the process of nationalization. In this context, and with strong influences from the hygienist movement,

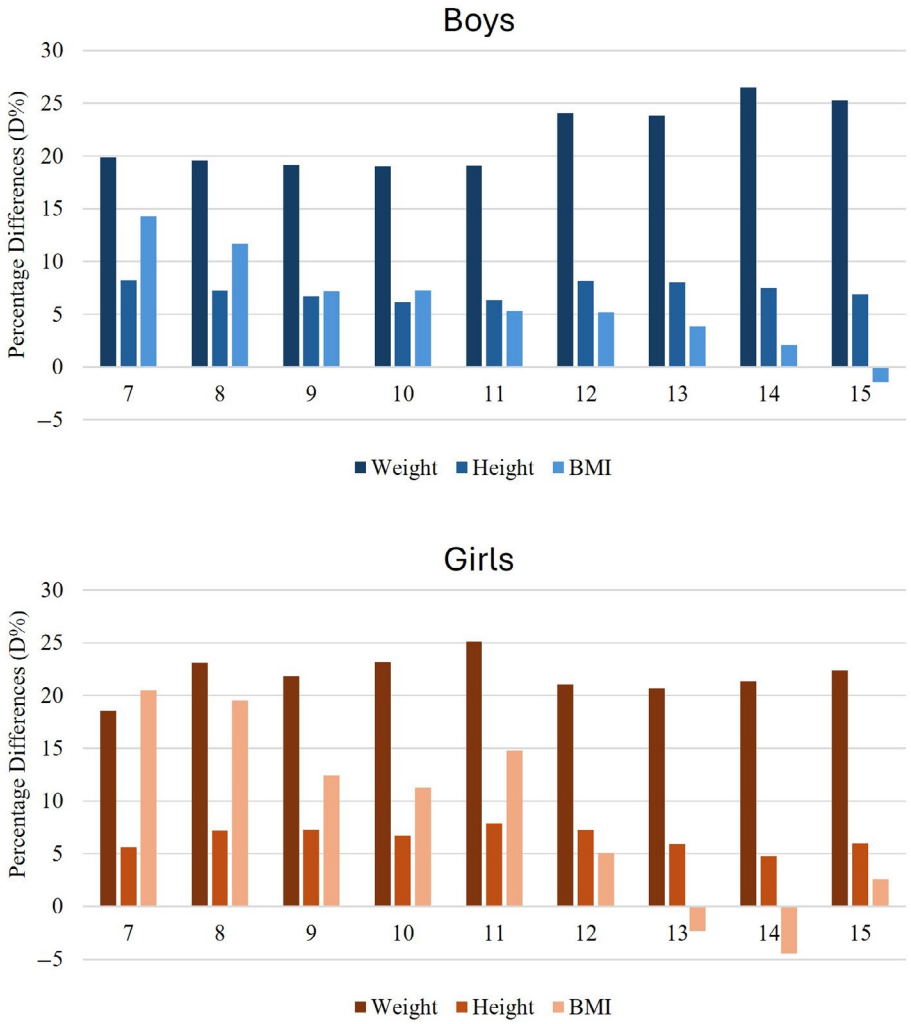

FIGURE 3 | Percentage differences between the means of weight, height, and body mass index of the Spanish and Argentinean schoolchildren. *Source:* Own elaboration.

school anthropometry emerged as an important opportunity for the care and intervention of weak, poor, and sick bodies, that is, those children who could not satisfactorily meet the demands of education. A good example of this was the school colonies in Madrid, which were designed with the aim of "restoring the physical energies of the child, weakened in an extremely poor social environment or as a result of a family defect, through a hygienic life plan in the mountains or by the sea, in order to make the child's education more positive" (Comas and Correas 1935).

Likewise, in order to identify weak bodies, it was also necessary to determine the typical growth pattern. In this way, Senet expresses the need for local research when he writes: "Admitting the scarce applicability of foreign conclusions in our country, the need arises for our own research in order to obtain more positive results. These works will solve two problems of capital importance in the study of ontogenetic evolution; one of purely scientific order and of general interest; the other of immediate application and of local interest" (Senet 1907, 27).

The growth differences observed by Senet in his study were also evident in our analysis of the weight and height of Spanish and Argentine schoolchildren. For both variables and at all ages, the values corresponding to the Spanish series were significantly lower. The deterioration observed in the growth variables of Spanish schoolchildren in the early 1900s was further demonstrated when weight, height, and BMI values were compared with those of the WHO international reference. It should be noted that around 60% of these children had a HAZ lower than −2. From a nutritional point of view, this means that a large proportion of schoolchildren in the colonies were stunted.

The results can be interpreted in relation to the characteristics of each population. The Spanish children who attended the holiday camps came from the lower socio-economic sectors of Madrid society, whereas the children who attended the Universidad Nacional La Plata schools were part of the local elite. It is noteworthy that Senet (1907) also states that the values of his student were closer to those obtained by Niceforo (1906) for the "upper class" than those corresponding to the "poor class." It is also important to consider that the data used in this study were collected at the beginning of the colonial period when it was already known that the social and physical conditions of these children were inferior to those of their Spanish counterparts (Montero et al. 2018).

TABLE 4 | Mean Z-scores for height-for-age (HAZ), weight-for-age (WAZ), and BMI-for-age (BAZ) estimated in relation to the WHO (2007) by sex, age, and country of origin.

Boys	WAZ		HAZ		BAZ	
Age (years)	Spain	Argentina	Spain	Argentina	Spain	Argentina
7	−2.02	−0.26	−2.21	−0.44	−0.70	−0.19
8	−1.88	−0.32	−2.11	−0.54	−0.60	0.04
9	−1.57	0.01	−1.70	−0.19	−0.61	0.27
10	−1.65	−0.24	−1.89	−0.56	−0.64	0.12
11			−1.97	−0.74	−0.95	−0.11
12			−2.19	−0.53	−0.92	0.00
13			−2.40	−0.79	−0.96	0.01
14			−2.52	−1.05	−1.18	0.19
15			−2.21	−0.81	−1.08	0.19
Girls	**WAZ**		**HAZ**		**BAZ**	
Age (years)	Spain	Argentina	Spain	Argentina	Spain	Argentina
7	−1.41	−0.03	−1.55	−0.44	−0.61	0.16
8	−1.81	−0.10	−2.10	−0.59	−0.67	0.24
9	−1.96	−0.37	−2.19	−0.66	−0.80	−0.05
10	−1.94	−0.32	−2.14	−0.76	−0.86	0.21
11			−2.44	−0.78	−1.00	−0.03
12			−2.33	−0.84	−1.01	−0.26
13			−2.02	−0.61	−0.96	−0.11
14			−2.01	−0.89	−1.06	−0.05
15			−2.09	−0.79	−1.01	−0.13

Source: Own elaboration.

The results obtained are striking if they are interpreted in the current context of both countries. However, it is important to consider what the socio-economic situation of both countries was in that historical period. At the beginning of the 20th century, Argentina was one of the most economically developed countries in the world, surpassing even the majority of European economies, including those of Italy, France, Germany, and Spain. The period between 1880 and 1914 represents the peak of economic growth in Argentina. According to Bartolomé and Lanciotti (2015), between 1900 and 1935 the growth of the Argentine economy was more pronounced than that of the Spanish economy. Already in 1913, Argentina's per capita income was twice that of Spain.

The so-called "Belle Époque" in Argentina was marked by the country's involvement in the first wave of globalization, characterized by significant mobility of goods and capital. In addition to the expansion of foreign trade and the influx of foreign capital, several key variables have been identified in the context of the country's modernization. These include significant population growth; waves of immigration; urban expansion; the extension of the railway network; advancements in communication; and improvements in education and overall welfare. Most notably, economic growth plays a central role in this transformative period (Sánchez 2016). Prior to the onset of World War I, the country's economic growth rate had averaged 6% for the previous 35 years. During the first two decades of the 20th century, it was a leading exporter of primary products (cereals, meat, wool, and leather) and a magnet for European immigrants. Its per capita income, adjusted for purchasing power, was 92% of the average of the 16 most advanced economies in the world (Blanchard and Pérez Enrri 2002; Cavallo and Cavallo Runde 2020).

In this context, it is possible that Argentine children lived in a more favorable environment, as reflected in the growth variables. As point Bogin, Silva, and Rios (2007) growth, and especially stature is a sensitive indicator of environment. Short stature combined with a relatively high cormic index (meaning short legs relative to total stature) is associated with a higher risk in adulthood for other pathologies. However, historical sources with anthropometric measurements during childhood for the early 20th century are scarce, which limits comparative analyses and interpretations. Despite these limitations, the results of

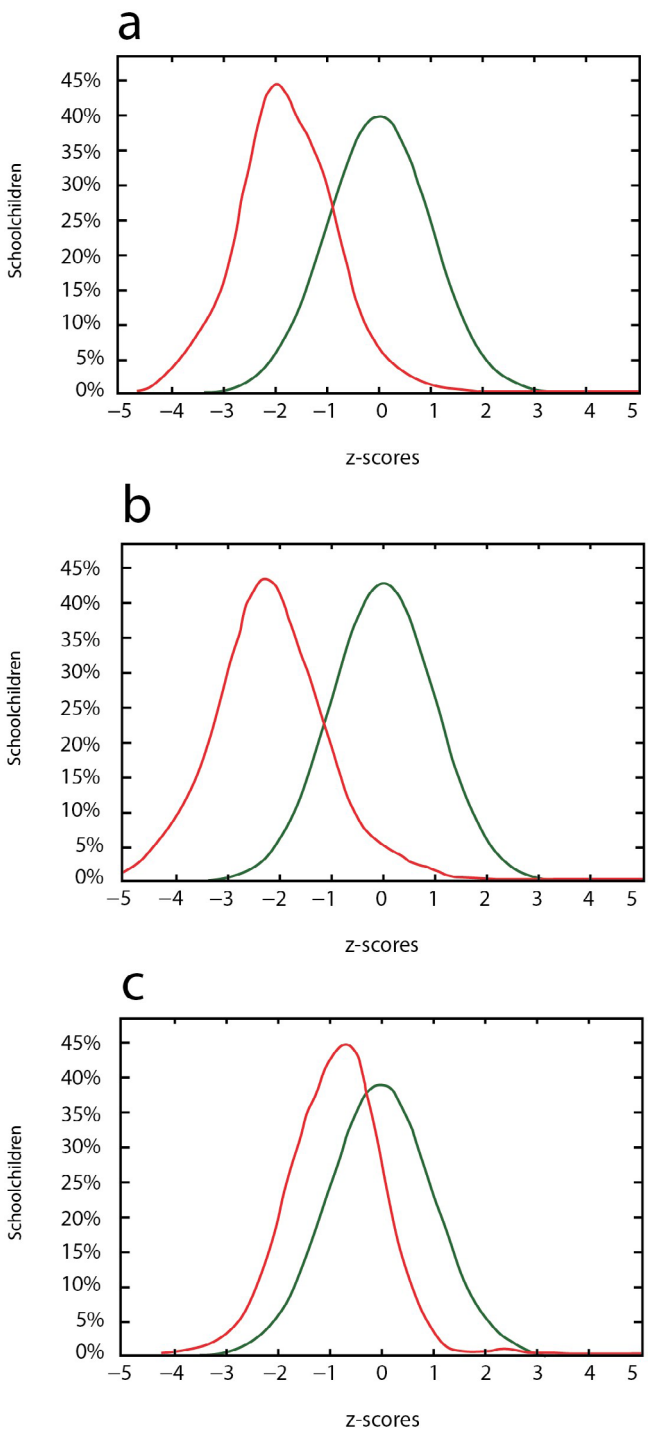

FIGURE 4 | Distribution of weight-for-age (WAZ) (a), height-for-age (HAZ) (b), and BMI-for-age (BAZ) (c) z-scores for schoolchildren in Spain (red lines) in relation to WHO (2007) values (green lines). *Source:* Own elaboration.

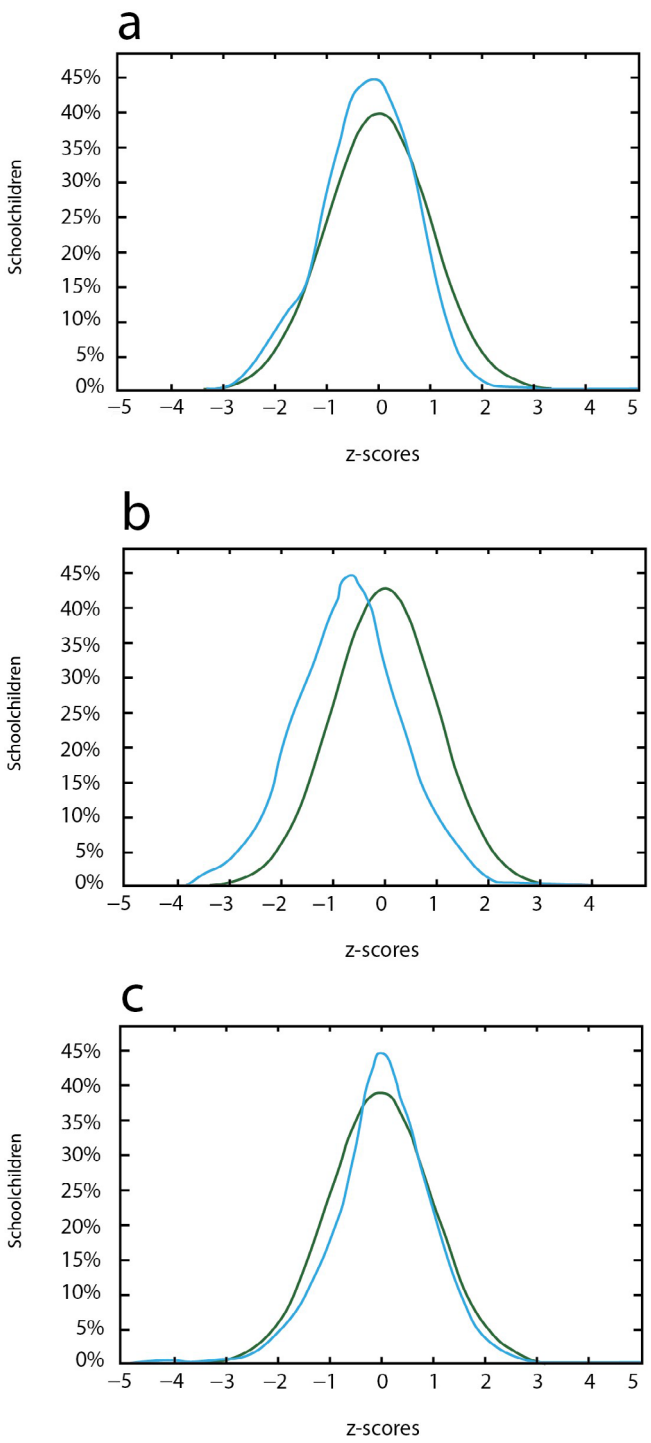

FIGURE 5 | Distribution of weight-for-age (WAZ) (a), height-for-age (HAZ) (b), and BMI-for-age (BAZ) (c) z-scores for schoolchildren in Argentina (blue lines) in relation to WHO (2007) values (green lines). *Source:* Own elaboration.

this study provide valuable insights that contribute to our understanding of childhood in the past.

5 | Conclusions

Anthropometric data from historical documentary sources in Argentina and Spain from the first two decades of the 20th century were analyzed. A comparative study of the data revealed significant discrepancies in the linear and ponderal growth of schoolchildren in both countries. Argentine boys and girls of La Plata were taller and heavier than their Spanish counterparts in Madrid during the same period (between 1903 and 1913). These results can be attributed to the higher standard of living that characterized the Argentine population at that time.

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Ethics Statement

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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