Paidéia
2020, Vol. 30, e3028.doi:https://doi.org/10.1590/1982-4327e3028
ISSN 1982-4327 (online version)

Intelligence and Socioeconomic Context on Childhood: Comparisons by Place of Residence and School Type

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Abstract: Different aspects of the socioeconomic context can affect intelligence. This study investigated the intellectual performance of children from different places of residence and school types. The analyses compared children from the outskirts (n = 169) and the central region (n = 110) from Porto Alegre; and children from private (n = 49) and public (n = 61) schools. Data collection included the Wechsler Abbreviated Scale of Intelligence (WASI) and sociodemographic record. Analysis of covariance (between groups) and Analysis of Variance for repeated measures (within-group) were used. Children from the outskirts region showed poorer performance on all WASI scores and, in the within-group comparison, lower results on verbal tasks – which did not occur in the central region group. Children from public and private schools differed in all WASI scores but had a similar within-group performance.

Keywords: intelligence, socioeconomic level, child development, Wechsler Scale

Inteligência e Contexto Socioeconômico na Infância: Comparação por Região de Moradia e Tipo de Escola

Resumo: Diferentes aspectos do contexto socioeconômico podem afetar a inteligência. Este estudo investigou o desempenho intelectual de crianças de diferentes regiões de moradia e tipos de escola. As análises compararam crianças da periferia (n = 169) e da região central (n = 110) de Porto Alegre; e crianças de escola privada (n = 49) e pública (n = 61). A coleta de dados incluiu a Escala Wechsler Abreviada de Inteligência (WASI) e ficha sociodemográfica. Utilizou-se Análise de Covariância (entre grupos) e Análise de Variância para medidas repetidas (intragrupo). O grupo de periferia apresentou menor desempenho em todos os escores da WASI e, na comparação intragrupo, resultados mais baixos nas tarefas verbais – o que não ocorreu no grupo da região central. Crianças de escolas públicas e privadas diferiram em todos os escores da WASI, mas apresentaram desempenho intragrupo semelhante.

Palavras-chave: inteligência, nível socioeconômico, desenvolvimento infantil, Escalas de Wechsler

Inteligencia y Contexto Socioeconómico en la Infancia: Comparación por Región de Vivienda y Tipo de Escuela

Resumen: Los diferentes aspectos del contexto socioeconómico pueden afectar la inteligencia. Este estudio investigó el desempeño intelectual de niños de diferentes regiones de vivienda y tipos de escuela. Se llevó a cabo una comparación de niños de la periferia (n = 169) y de la región central (n = 110) de Porto Alegre con niños de escuelas privadas (n = 49) y públicas (n = 61). Para recopilar los datos se utilizó la Escala de Inteligencia Abreviada de Wechsler (WASI) y la ficha sociodemográfica. Se aplicó el análisis de covarianza (entre grupos) y el análisis de varianza para medidas repetidas (intragrupo). El grupo de la periferia tuvo un desempeño más bajo en todos los puntajes de la WASI y presentó los resultados más bajos en las tareas verbales en la comparación intragrupo, lo que no ocurrió con el grupo de la región central. Los puntajes de los niños de las escuelas públicas y privadas fueron distintos en todos los puntajes de la WASI, pero en la comparación intragrupo tuvieron un rendimiento similar.

Palabras clave: inteligencia, nivel socioeconómico, desarrollo infantil, Escalas de Wechsler

The relevance of a healthy and quality environment for the development of intelligence is well established in the literature. Factors such as socioeconomic status (Flores-Mendoza et al., 2017; Hurt & Betancourt, 2017) and the quality of stimulation (Blums, Belsky, Grimm, & Chen, 2017) and education (Von Stumm, 2017) are strongly correlated to the intelligence quotient (IQ) of the populations.

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Article derived from Course Conclusion Paper of the first author under the guidance of the last two, defended in 2015, at the Psychology Undergraduate Degree of the Federal University of Rio Grande do Sul.

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The understanding that variables such as these can interfere in the assessment of intelligence impacts the classical understanding of mental faculties explained mainly by a combination of individual skills and acquired knowledge.

Socioeconomic status (SES) has been highlighted among the factors that can affect how intelligence develops or manifests itself. The social inequalities present in certain cultures, especially in Latin America, might be hindering the cognitive potential of individuals in more precarious situations of income, housing, and education. Von Stumm and Plomin (2015), in a longitudinal study, obtained positive correlations between social variables and intelligence from childhood to adolescence. Similar results were found in further research by Von Stumm (2017). Both studies indicated the possibility of a cumulative effect, in the long run, of the differences between levels of education, occupation, and parental income, variables that make up the family's SES.

The place of residence, especially in contexts of social inequality, is an important marker of possible performance differences in intelligence tests (Ardila, 2012). In Brazil, different types of schools are associated with differences in SES and performance in intelligence tests, as shown by Cavalini, Mecca, Pinheiro, Cruz-Rodrigues, and Macedo (2015) and by Piccolo et al. (2016). The school type, therefore, deserves to be highlighted in the study of intelligence (Alves, Gomes, Martins, & Almeida, 2017; Jacobsen, Moraes, Wagner, & Trentini, 2013; Schwartz, 2015). Flores-Mendoza et al. (2015) demonstrated that school type (private, public, or mixed), had a greater power of predicting school performance than individual variables. Duarte, Bos, and Moreno (2010) found similar data, in which 49.2% of the variance in school performance was explained by the school type.

Based on what was discussed, this study aims to investigate which specificities can be observed in the performance of children from places of residence with different Basic Education Development Index (Índice de Desenvolvimento da Educação Básica - IDEB). We hypothesize, based on Rossetti-Ferreira, Ramon, and Silva (2002), that developing countries present greater differences between human development indexes in central and outskirt regions than developed countries. Besides, this research discusses specific differences in intelligence performance considering analyses carried out by school type and place of residence – which contributes to the understanding of how different contextual factors are related to intelligence in childhood.

Therefore, this study aimed to investigate the intellectual performance of children from different places of residence and school types. For that, different socioeconomic contexts were considered, represented by place of residence and school type, separately. Our specific objectives were: (a) to investigate whether children from different urban regions (more central or more outskirt areas of a capital city) differ in the scores obtained in intelligence test; (b) to investigate the within-group performance on an intelligence scale for children from each place of residence; (c) to investigate whether children attending different school types (public or private) have differences in the results obtained in intelligence test; and (d) to investigate the within-group performance on an intelligence test for children from each school type.

Method

For this study, two stages of analysis were performed. The first one sought to compare the performance of children from different places of residence with economic inequality in an intelligence test (specific objectives *a* and *b*); The second stage aimed to investigate whether the scores in intelligence tests differ between children from public schools and children from private schools (specific objectives *c* and *d*). Samples previously described in Kolben (2014) and Trentini, Yates, and Heck (2014) were used. Kolben investigated children from the outskirts of Porto Alegre/RS. Trentini et al. (2014) conducted their research in public and private schools in the central region of the same city for the Brazilian standardization of the Wechsler Abbreviated Scale of Intelligence - WASI (Wechsler, 1999).

The study design is quantitative and quasi-experimental (Creswell, 2010). Contrasting groups comparison (Frankfort-Nachmias & Nachmias, 1996) was used, using cross-sectional data collection.

Participants

Stage 1 - Different places of residence. Subjects from both previously mentioned studies participated in this stage, with a total of 279 children, who were divided into two distinct groups. The first group, called Group 1, included the 169 participants from the study by Kolben (2014). These children lived in the outskirts of the capital, characterized by a precarious socioeconomic situation. This region is marked by a socioeconomic context of high rates of poverty, marginalization, and social inequality. According to the 2010 Demographic Census, conducted by IBGE (Brazilian Institute of Geography and Statistics – IBGE, 2012), the average income of heads of household was 2.03 minimum wages, being among the five worst places in the 84 neighborhoods from Porto Alegre. In addition, the same data shows that 41.70% of the heads of the family had an income of up to one minimum wage, which represents the last place among the regions of the city. The school in which these data were collected has one of the lowest scores of Porto Alegre in IDEB (4.4 in a scale from 0 to 10), raised by the National Institute of Educational Studies and Research (INEP, 2013).

The second group, or Group 2, was composed of 110 subjects. All children in this group are from the WASI standardization study. These subjects lived in central regions of the city of Porto Alegre. IBGE data show the neighborhoods located more centrally in the capital as the best placed in the statistics of income per minimum wage and IDEB (5.6 on a scale from 0 to 10). The census numbers show the different socioeconomic realities of the two groups.

Stage 2 - Different types of school. For this stage, only the data from the WASI standardization study were used, because it has an equivalent number of children studying in public schools and private schools, in addition to all of them living in central areas of the city. We avoided using the subjects of the study by Kolben (2014) to control the variable influence of place of residence, examined in the previous stage.

Thus, the present analysis stage included 110 subjects from the WASI standardization collection, who were aged from six to nine years old. This total was divided into two groups, one of which was made up of 49 children from private schools, and the other of 61 children from public schools. Both groups were formed by children studying in Porto Alegre, with varied SES, but a higher concentration of participants from the middle social class (B and C), according to the 2009 Brazilian Criterion of IBGE (Associação Brasileira de Empresas de Pesquisa, 2011).

Instruments

Wechsler Abbreviated Scale of Intelligence - WASI (Brazilian version) (Wechsler, 1999). Adapted by Trentini et al. (2014), WASI is a brief instrument used to assess the intelligence of people from 6 to 89 years of age. It consists of four subtests, two of which are part of a verbal scale (Vocabulary and Similarities), and two of which are part of a performance scale (Block Design and Matrix Reasoning). The scale is applicable in an approximate time of thirty minutes. WASI has adequate evidence of construct validity (factor analysis indicated two components, verbal and performance); convergent validity with the Raven's Coloured Progressive Matrices (correlations between 0.65 and 0.79) and Raven's Standard Progressive Matrices (correlations between 0.61 and 0.81); WISC-III (r = 0.75, $p < 0.01$), WISC-IV (r = 0.89, $p < 0.01$), and WAIS-III (r = 0.81, $p < 0.01$); and criterion validity with clinical groups (Intellectual Disability and probable Alzheimer's dementia). The instrument was also reliable by inter-rater agreement on verbal subtests (0.89 and 0.92); internal consistency analysis (correlation between the two halves = 0.85 to 0.96 and Cronbach's alpha = 0.82 to 0.95), and test-retest stability (between 0.76 and 0.90) (Trentini et al., 2014).

Sociodemographic data record: used to collect information from the participants such as: age, sex, years of schooling, school grade, and place of residence.

Procedure

Data collection. WASI and the sociodemographic data record were administered at the beginning of the school year, after the students' adaptation period at school. The collections took place on the premises of the educational institutions and were administered by previously trained psychologists and psychology students.

Data analysis. All analyses were performed in the Statistical Package for Social Sciences (SPSS version 19.0). Descriptive analyses were used for age and years of schooling, and frequency analyses were used for sex and education. Analysis of covariance (ANCOVA) was used to account for the effects of years of schooling, while comparing the average performance between the groups regarding the standardized scores of the Vocabulary, Block Design, Similarities, and Matrix Reasoning subtests; and their composites Verbal, Performance, and Total IQ. The Cohen's *d* test (f^2) was used to verify the effect size of the difference in performance between groups. We chose to use it because it is a more appropriate effect size measure for groups with different sample sizes (Lakens, 2013).

In addition, within-group analyses were carried out to investigate the specific performance pattern of each group. For this procedure, Analysis of Variance (ANOVA) was used for repeated measures, with Bonferroni correction. The variables studied here were: T scores of the Vocabulary, Block Design, Similarities, and Matrix Reasoning subtests; scores composed of Verbal IQ and Performance IQ. To calculate the effect size, f^2 was used. For the purpose of interpreting the effect size, Cohen's (1988) proposal was used: insignificant ≤ 0.19; small 0.20-0.49; medium 0.50-0.79; large 0.80-1.29, as well as Rosenthal's (1996), who classified a very large effect as above 1.30.

Ethical Considerations

The children agreed to participate, and their guardians signed the Informed Consent Form. This study is part of a larger study that investigated the evidence of validity and reliability of WASI. It was approved by the Research Ethics Committee of the Federal University of Rio Grande do Sul (Opinion No. 11,008).

Results

Stage 1 - Different places of residence

Group 1 (outskirt regions) was composed of 50.3% of female members. All children in this group were attending the first or second year of elementary school. In Group 2 (central regions), most participants were male (57.4%). In this group, 70.0% of children were in the first two years of elementary school, and the remainder was divided between the third (15.5%), fourth (7.3%), and fifth-year (7.3%). Despite a higher frequency of male participants in Group 2, no significant associations were found between regions and sex of the participants, χ^2 (1) = 1.62, p = 0.20.

Both groups had participants aged between six and nine years old. The mean age of Group 1 was 6.80 years (SD = 0.84), while in Group 2, it was 7.31 years (SD = 1.11). Children in Group 1 had less than one year of complete study, which represented a mean of 0.47 (SD = 0.50). Group 2 included children who completed four or less years of study, resulting in a mean of 1.16 (SD = 1.20). The groups differed significantly in mean age ($t(199.46) = 4.16, p < 0.05$) and years of schooling ($t(133.94) = 5.76, p < 0.05$).

Results of between group comparison. Table 1 shows the mean scores on intelligence test for both groups as well as the difference between them and its size effects. The covariance analysis showed no significant difference in years of schooling ($F(1, 276) = 0.001$ to 0.81, $p = 0.36$ to 0.99), indicating no significant effects of this variable when the means scores in intelligence were compared. There were statistically significant differences between Groups 1 and 2 in all subtests and composite WASI scores. It was also possible to observe that the effect size was very large in all comparisons (Rosenthal, 1996).

Results of within-group comparison. Table 2 shows the results of within-group analyses, showing the differences between the means of the WASI subtests within each group, the effect size of the differences, and the lower and upper limits of the confidence interval. It was possible to find a different performance pattern for children from outskirt regions (Group 1) and for children from central regions (Group 2). Children living in the outskirt area of Porto Alegre differed internally in their scores, while children from more central regions showed little variation in their performance.

In Group 1, significant within-group differences were found between most subscales. The children in this group obtained results that differed significantly in the subtest pairs of Vocabulary and Block Design (large effect size), Vocabulary and Matrix Reasoning (medium effect size), Block Design and Similarities (large effect size), Block Design and Matrix Reasoning (small effect size), and Similarities and Matrix Reasoning (medium effect size). The only subtests that did not differ significantly from each other were Vocabulary and Similarities. Group 2, on the other hand, presented a more uniform within-group performance, in which the only pair of subtests with significant difference between them was Block Design and Matrix Reasoning. However, it is noteworthy that this difference had a small effect size ($f^2 = 0.229$).

Table 1
Mean performance in WASI scores and comparison of means between groups

	Group 1[*]	Group 2[**]	Difference between means	Effect size[a]
	Mean (*DP*)	Mean (*DP*)		
T Score				
Vocabulary	31.80 (6.640)	50.95 (9.823)	18.961[*]	2.370
Block Design	38.64 (7.565)	49.78 (9.601)	10.844[*]	1.319
Similarities	32.16 (5.804)	52.02 (10.547)	20.215[*]	2.463
MR	36.43 (8.703)	53.34 (9.795)	17.070[*]	1.846
IQ				
Verbal	69.40 (9.029)	102.37 (15.031)	33.168[*]	2.787
Performance	79.25 (12.431)	102.77 (14.025)	23.368[*]	1.796
Total	70.94 (9.731)	102.87 (14.169)	31.939[*]	2.722

Note. Group 1 ($n = 169$); Group 2 ($n = 115$); MR = Matrix reasoning; variables MR and Performance IQ were the only ones in which equality of variances was assumed; [a]Cohen's *d* effect size (f^2) – insignificant ≤ 0.19; small 0.20-0.49; medium 0.50-0.79; large 0.80-1.29 (Cohen, 1988); very large > 1.30 (Rosenthal, 1996).

Table 2
Comparison between T Score and Verbal and Performance IQ means obtained by groups from different places of residence in the subtests

	Difference between means	Effect size[c]	95% Confidence Interval of the difference between means	
			Lower limit	Upper limit
Group 1[a]				
Vocabulary – Block Design	−6.834[**]	0.961	−8.665	−5.003
Vocabulary – Similarities	0.355	0.058	−1.879	1.169
Vocabulary – MR	−4.621[**]	0.598	−6.379	−2.864
Block Design – Similarities	6.479[**]	0.961	4.824	8.135
Block Design – MR	2.213[*]	0.271	0.454	3.972
Similarities – RM	−4.266[**]	0.577	−5.955	−2.577
Verbal IQ– Performance IQ[b]	−9.852[**]	0.907	−11.941	−7.763

Continued...

Table 2
Continuation

	Difference between means	Effect size[e]	95% Confidence Interval of the difference between means	
			Lower limit	Upper limit
Group 2[c]				
Vocabulary – Block Design	1.417	0.120	−1.561	4.396
Vocabulary – Similarities	−1.096	0.105	−3.574	1.383
Vocabulary – MR	−1.991	0.244	−4.769	0.786
Block Design – Similarities	−2.513	0.222	−5.279	0.253
Block Design – MR	−3.409*	0.229	−5.677	−1.140
Similarities – RM	−.896	0.130	−3.632	1.840
Verbal IQ – Performance IQ[d]	0.148	0.028	−3.269	3.564

Note. Group 1 – peripheral region (n = 169); Group 2 – central region (n = 115); MR = Matrix reasoning; [a]F (3.504) = 54.437, $p < 0.001$; [b]F (1.01, 170.02) = 149.656, $p < 0.001$; [c]F (2.72, 310) = 4.34, p = 0.007; [d]F (1.04, 118.90) = 0.049, p = 1.00; **$p < 0.001$; *$p < 0.05$; [e]Cohen's d effect size (f^2): insignificant ≤ 0.19; small 0.20-0.49; medium 0.50-0.79; large 0.80-1.29 (Cohen, 1988); very large > 1.30 (Rosenthal, 1996).

Still on the within-group results, Table 2 shows the comparison between the means of the Verbal IQ and Performance IQ scores for each group, as well as the upper and lower limit of the confidence interval. Repeated measures analyses of variance were performed with these subscales. In Group 1, the mean of the Verbal IQ was lower than that of the Performance IQ, which represented a significant difference of large effect size (f^2 = 0.907). Meanwhile, in Group 2, no statistically significant difference was found when comparing the means between these variables.

Stage 2 - Different school types

The Public School Group was composed mainly of boys (60.9%). Children were more concentrated in the first two years of elementary school (63.9%). In the Private School Group, most participants were also boys (54.0%). In this group, most children were in the first (42.9%) or second year of elementary school (34.7%), and the remainder was divided between the third (12.2%) and the fourth year (10.2%).

Both groups were composed of participants aged between six and nine years old. The mean age of the Public School Group was 7.28 years (SD = 1.11), while in the Private School Group, it was 7.32 years (SD = 1.09). Public School children had a mean of 1.38 years (SD = 1.31) of schooling. In the Private School Group, children completed, on average, 0.90 (SD = 0.98) years of schooling. The groups did not differ significantly in the mean age, but showed a significant difference in terms of years of schooling (t(107.46) = 2.18, $p < 0.05$).

Results of between group comparison. Table 3 shows the mean scores on intelligence test for both groups as well as the difference between them and its size effects. In this stage, covariate analyses were also used, to control the effect that the difference in years of schooling could have on the results. This covariate did not show statistical significance for any of the assessed scores (F(1.107) = 0.09 to 2.31, p = 0.13 to 0.76).

The groups differed significantly in all measures. Public School children had lower scores than those from Private School. In the comparison, no difference presented a large effect size. The comparison between the Vocabulary and Similarities subtests and the Verbal, Performance, and Total IQ subscales showed a medium effect size. The differences between the means of the Block Design and Matrix Reasoning subtests obtained a small effect size.

Table 3
Comparison between the means of the groups in the WASI scores by school type

	Public School[1]	Private School[2]	Difference between means	Effect size[a]
	Mean (*DP*)	Mean (*DP*)		
T Score				
Vocabulary	48.56 (8.44)	53.96 (10.58)	5.39*	0.572
Block Design	47.86 (9.42)	51.90 (9.17)	4.04*	0.434
Similarities	49.14 (9.82)	55.78 (10.15)	6.64**	0.664
MR	51.05 (9.87)	55.48 (9.34)	4.43*	0.460
IQ				
Verbal	97.70 (15.20)	109.74 (18.46)	12.03***	0.730
Performance	99.36 (13.85)	106.24 (13.33)	6.88*	0.505
Total	98.36 (12.81)	108.12 (13.98)	9.76 ***	0.732

Note. MR = Matrix reasoning; Public School Group (n = 64); Private School Group (n = 50); in all scores, equality of variances was assumed; [a]Cohen's d effect size (f^2) – insignificant ≤ 0.19; small 0.20-0.49; medium 0.50-0.79; large 0.80-1.29 (Cohen, 1988); very large > 1.30 (Rosenthal, 1996).

Results of within-group comparison. Table 4 shows the differences between the subtest means within each group. From this, it was possible to observe that the groups did not differ regarding the internal performance standard, both presenting uniform results on the scale. The vast majority of subtest pairs did not obtain a significant difference in means for the two groups, except for the Block Design and Matrix Reasoning pair, which differed both for public and private school children, but with a small effect size.

Table 4
Comparison between T Score and Verbal and Performance IQ means obtained by groups of different school types in the subtests

	Difference between means	Effect size[e]	95% Confidence Interval of the difference between means	
			Lower limit	Upper limit
Public School[a]				
Vocabulary – Block Design	0.703	0.078	−3.213	4.619
Vocabulary – Similarities	−0.578	0.069	−4.096	2.940
Vocabulary – MR	−2.484	0.271	−6.421	1.452
Block Design – Similarities	−1.281	0.133	−4.933	2.370
Block Design – MR	−3.188**	0.331	−6.273	−0.102
Similarities – RM	−1.906	0.188	−5.769	1.956
Verbal IQ– Performance IQ[b]	−1.500	0.127	−5.981	2.981
Private School[c]				
Vocabulary – Block Design	2.060	0.208	−2.770	6.890
Vocabulary – Similarities	−1.820	0.179	−5.501	1.861
Vocabulary – MR	−1.520	0.152	−5.645	2.605
Block Design – Similarities	−3.880	0.401	−8.313	0.553
Block Design – MR	−3.580*	0.383	−7.159	−0.001
Similarities – RM	0.300	0.032	−3.762	4.362
Verbal IQ – Performance IQ[d]	1.980	0.081	−3.506	7.466

Note. MR = Matrix reasoning Public School Group ($n = 64$); Private School Group ($n = 50$); [a]F (2.765, 174.169) = 2.056, $p = 0.039$; [b]F (1.046, 65.924) = 0.687, $p = 1.00$; [c]F (2.624, 128.570) = 2.780, $p = 0.049$; [d]F (1.032, 50.563) = 1, $p = 1.00$; $^{**}p < 0.05$; $^{*}p = 0.05$; [e]Cohen's d effect size (f^2) – insignificant ≤ 0.19; small 0.20-0.49; medium 0.50-0.79; large 0.80-1.29 (Cohen, 1988); very large > 1.30 (Rosenthal, 1996).

Table 4 also shows the analysis performed for the values of Verbal IQ and Performance IQ. No significant differences were found between the subscales. These results were observed in both groups, which indicated a uniform performance in the intelligence test both for public and private school children.

Discussion

This study aimed to investigate the performance of children from different places of residence and different school types in intelligence tests. The results indicated significant differences in the intelligence levels concerning both the place of residence and school type. From the comparisons made between the groups, it is possible to understand that the variables representing the SES influenced the assessment of intelligence. Similar results have been pointed out by the literature in several countries (Hanscombe et al., 2012; Jacobsen et al., 2013; Millones, Flores-Mendoza, & Rivalles, 2015; Schoon et al., 2011).

Children from outskirts regions had significantly lower results than children from central regions, with large effect size, in all scores measured by WASI. This shows a sensitivity of all the skills measured by the scale to differences in the environmental context, even with the control of the difference in years of schooling. The classic model of fluid and crystallized intelligence considers the former to be less affected by context variables and more dependent on biological factors (Cattell, 1963). However, the results found here showed that there is a possibility that an impoverished environment can also affect fluid intelligence, which refers to the individual's ability to solve new and abstract problems without using prior knowledge. Other studies have found similar data when demonstrating relationships between socioeconomic variables and IQ scores using fluid intelligence tests, such as matrix tasks (Colom & Flores-Mendoza, 2007; Flores-Mendoza et al., 2015; Jacobsen et al., 2013; Millones et al., 2015). As explanatory hypotheses for such relationships, one can think that other variables (for example, the executive component of cognitive flexibility), susceptible to environmental stimulation, may be associated with fluid measures. In addition, neuronal plasticity may be associated with the impact that certain contexts can have on cognitive development.

In the comparison of groups by place of residence, the internal performance pattern was discrepant considering the scores of different types of tasks. The participants in the central region differed significantly in only two subtest pairs (small effect size), while those in the outskirt region obtained a markedly different performance in five of the six subtest pairs (large effect size). Thus, verbal skills may be more susceptible to environmental variables, since children from contexts with a lower SES scored significantly lower on verbal tasks (also observed regarding IQ scores).

Measures related to language skills are more associated with crystallized aspects of intelligence. Thus, tasks linked to acquired skills and previous experiences seem to be more influenced by the context than fluid intelligence. Schoon et al. (2011) found evidence that verbal skills are more affected by poverty variables than non-verbal ones. Kaya, Stough, and Juntune (2016) found discrepancies between verbal and non-verbal tasks among low-income students, a finding similar to that of this study.

In the analyses that compared the performance of the groups by school type, significant differences were found between all WASI scores, even though controlling the number of years of schooling. However, in contrast to the results of the analysis by place of residence, there were no large effect sizes for differences in means. A small effect size was obtained when comparing non-verbal tasks, and a medium one when analyzing verbal subtests. Children who studied in public schools underperformed those who attended private schools. We highlight that the differences in the means that had the largest effect sizes are related to verbal skills. These data point to crystallized intelligence as being more sensitive to environment variables, although fluid capacities have also been affected, as in the previous stage. Ardila, Rosselli, Matute, and Guajardo (2005) observed that the school appeared more related to scores of non-verbal graphic tasks than tests of verbal fluency. However, the authors explained this result by the parental education of the participants, which was related to most of the tasks used to measure executive functioning – and appeared to be more related to the children's scores in verbal tests. In within-group comparisons, which assessed discrepancies between pairs of different subtests for each subject, both the private school group and the public school group did not show fluctuations in their performance. The variable school type, therefore, was not decisive to establish a difference in the internal performance of the groups, that is, it does not seem to be related to within-subjects variations in the test results.

The findings of this study give clues about the importance of the place of residence and school type for the development of intelligence. The first, in this case, appeared as the most relevant in the cognitive assessment. Flores-Mendoza et al. (2015) showed that the school's SES may be more important than the individual's SES when predicting performance in intelligence tests. However, from the results of our study, one can think that, underlying the school type variable, there is the region in which the institution is inserted. It seems pertinent to consider the possibility that the SES of a region affects the development of cognitive skills assessed by WASI more than the SES of the school. Thus, the fact that the school is public or private would make a difference only in a larger context, in which other factors would also appear unequal.

The concept of SES can be represented and evaluated by multiple variables. The differences found in this study, mainly marked by urban regions distinctly classified into development and education indexes, might be due to variables underlying those that differentiated the groups. Inequalities in factors such as parental education and parental occupation, which have been identified in the literature as important for quality stimulation of children (Ardila et al., 2005; Jacobsen et al., 2013; Schoon et al., 2011), are probably immersed and covered in a design that separates the groups by place of residence, as used in our study.

Concerning the cognitive skills most affected by different types of environmental stimulation, verbal skills appeared to be more sensitive to contextual inequalities. What causes children in poorer regions to develop their verbal skills less than other skills? Some authors have described specificities of environments marked by socioeconomic differences that can contribute to this reality. Ardila (2012) points that in the context of high SES children are exposed to a richer vocabulary, with a greater number of words, diversified information, and greater assimilation of popular culture. Nisbett (2009) relates these stimuli to gains in intelligence, and stresses the importance of how parents relate to their children. The author stated that families of higher SES tend to talk more with their children and instruct them in the use of language. Parents' expectations of their children also seem to vary according to the cultural and economic context, which can reverberate in the way of encouraging children to seek activities with higher cognitive performance (Ardila, 2012).

In addition, some authors have pointed out that environmental aspects can play the role of mediators in the way in which genetic characteristics are manifested (Hanscombe et al., 2012; Schwartz, 2015). According to their results, inferior performances in intelligence tests of children from impoverished contexts are best explained by environmental variables, whereas, for children of higher SES, the results appear more correlated to genetic attributes. This shows that subjects in a situation of poverty may have not received a stimulation that would allow the manifestation of a genetic potential. The results observed here may also indicate a greater heterogeneity among children from more vulnerable contexts, since they live with diversified social and economic risk factors, related to specific impacts on the development of intelligence.

Another point to be discussed is that the very lower means of the intelligence scale in the performance of groups of lower SES elucidate possible limitations in the design of cognitive tests. It seems unlikely for a population to be mainly characterized by mental abilities fitting a limiting frame of intellectual functioning. Wechsler scales can be highly associated with contextual variables. Roazzi and

Souza (2002) argued that the instruments commonly used in intelligence tests are taken by a sociocultural bias, which prioritizes skills considered and stimulated for a Western and industrialized context. It is possible that some social subgroups are not included in the testing standards. Therefore, biases like these should be considered. One must carry out both the development of new tests and the adaptation and validation of the instruments already available, to include children in contexts of low SES.

This study has limitations, among which the impossibility of including, in the analyses, more specific data of the participants, such as income, parental education, and parental occupation. In addition, in the comparison by place of residence, participants in Group 1 (central region) were divided into different school types. Despite this, due to the within-group results, we believe that the participants from private schools may have contributed to accentuate an already significant difference.

These findings can contribute to the reflection on the measurement of intelligence in psychological assessment processes. The performance expectation for children from outskirts regions or from public schools may need to be relativized because of their context and their life history, which cannot be covered by normative data. Finally, it is essential to understand how these inequalities are contributing to impairments in cognitive functions, or how results that show these impairments are being interpreted and discussed. This will make it possible to develop projects that promote protective factors for the development of these children.

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Authors' Contribution:
All authors made substantial contributions to the conception and design of this study, to data analysis and interpretation, and to the manuscript revision and approval of the final version. All the authors assume public responsibility for the content of the manuscript.

Received: Apr. 10, 2018
1st Revision: Jul. 03, 2018
Approved: Jul. 09, 2018

How to cite this article:
Kroeff, C. R., Yates, D. B., Mendonça Filho, E. J., Bandeira, D. R., & Silva, M. A. (2020). Intelligence and socioeconomic context on childhood: Comparisons by place of residence and school type. *Paidéia (Ribeirão Preto), 30,* e3028.doi:https://doi.org/10.1590/1982-4327e3028