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Relative age effect on academic achievement of pupils at lower primary Level: Evidence from Uganda

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Abstract
In this study we tested the existence of relative age effect on academic achievement of pupils whose median age was 10 years. Specifically, the study investigated the relative age effect in mathematics and English language academic achievement while controlling for the other pupil characteristics and location of their school.
Findings show that academic achievement in mathematics was better for the older pupils while in English language the younger pupils performed better. With respect to relative age effect, this study reveals significant gender differences, with results showing consistent lower scores for the boys than girls in both English language and mathematics. Apparently, this suggests that being relatively young in a cohort is more beneficial to girls.

Keywords: relative age effect, achievement, lower primary level, cohort, Uganda

1. Introduction

1.1. Background Information

This study set out to test existence of relative age effect (RAE) on academic achievement of primary three pupils (where median age was 10 years). Specifically, the study investigated the RAE in mathematics academic achievement and in English language academic achievement, on the basis of pupil characteristics and location of pupil's school.

The study used secondary data on progress in education, collected in the year 2015 by the National Assessment of Progress in Education (NAPE) of the Uganda National Examinations Board (UNEB). The dataset on primary three pupils, contained 24,043 data points on variables of interest including age, gender, school location, region and school ownership.

Academic achievement in mathematics and English language were classified as presented in the Table 1.

Table 1: Classification of academic achievement.

Classification of Achievement Level	English language (Literacy in English) [%]	Mathematics (Numeracy) [%]
Advanced	66 - 100	83 - 100
Adequate	42 - 65	49 - 82
Basic	25 - 41	26 - 48
Inadequate	0 - 24	0 - 25

Adopted from Uganda National Examinations Board (UNEB)

1.2. Literature Review

A child's age in comparison with the age of his or her peers (relative age) has been found to be an influential factor on his/her academic achievement. Considering a cohort (i.e. a group of pupils working together through the same academic curriculum from beginning to end [1], literature is awash with the effect of age on various life outcomes, such as sports [2, 3], academic achievement [4-6], level of educational attainment [7-9] and earnings [10-13].

According to [4, 14], one widely recognized method of investigating the effect of relative age is to investigate how the relative position of a child with regards to his or her age has an effect on academic achievement when the average age of the class or cohort is higher or lower. The "relative age effect (RAE)" in school, suggests that being the oldest in the cohort is advantageous [11]. Hence, many parents or guardians, especially the affluent ones, tend to delay their children's entry into formal education so that the children gain relative advantage in school on the account of being older and, therefore, more mature in comparison to the others in the cohort [15, 16]; the practice commonly referred to as academic "redshirting." Apparently, the likelihood of delayed school entry is more common for some subgroups. Several studies, [15, 17] show that boys are much more likely to be held back than girls.

Research findings suggest that significant gender differences may exist in terms of social or emotional development, behavioural regulation, and academic achievement among primary school pupils and may explain why girls outperform boys in early development measures [18], with boys consistently scoring lower than girls in both language and mathematics at lower primary school level [19, 20]; premised on the evidence that boys do not mature as quickly as girls [21-25]. Scholars have attempted to explain this phenomenon in which boys regularly score lower than girls in both language and mathematics at lower primary school level. For instance, [26, 27] attempted to explicate the phenomenon on the basis of medical insight, [28, 29] on the basis of the amount of time spent in school; all unsuccessfully. Presently, the hypothesis that has proved plausible is the RAE [30]. For deeper insight, here, recourse may be made to cognitive–evolutionary model underpinning (by Jean Piaget) which focus on "normative"

changes that occur throughout human life cycle in relation to age or truly in relation to specific phases or evolutionary stages in which human development may be divided [31]. Hence, a school of thought that may elucidate the relationship between age and psychological progression could be maturation [32]. Among the characteristics that define the human species is birth itself, which comprises of a high degree of structural and functional immaturity which progressively and, following a certain maturation calendar, yields to greater degree of maturity. In this sense, maturation seems to follow a regular and predictable sequence in the early stages of life cycle, later buckling to other influences such as culture, historical moment and social grouping. According to [33], the month of birth matters in achievement tests and even shows long-run effects past post-compulsory education. Nevertheless, studies by [31] have demonstrated that RAE decreases as age increases as the normalising influence of formal schooling increases.

The question of whether a group composition matters for the outcome of an individual group member has received considerable attention in numerous contexts where social interactions are a likelihood, especially in education settings [34-41]. Indeed, a number of studies have found that exposure to higher-achieving or less-disruptive peers has benefits for a child's own achievement and behaviour [35, 36, 42, 43], while exposure to more disruptive peers can be detrimental [44-46] due to spill-over effect. To this end, [40] found some small positive effects of having older children in the classroom conditional on one's own age. Recent research on peer effects has found that girls are more responsive to higher-achieving peers than boys [38, 47]. This suggests that being relatively young in a cohort may be more beneficial to girls.

The policy of grouping students in the same academic year in school is based on date of birth. In general, students who are born within the same calendar year are grouped in the same class [48]. This measure seeks for learners to have the minimum possible differences among themselves. Nevertheless, in a developing country such as Uganda, the age range in a cohort of learners can be quite wide given that some pupils commence formal education at a much older age as a result of factors such as inability to afford school fees earlier or the nearest school being at a distance too far to be daily walked to by a young child. In developing countries, it has been observed that repeaters and students who enrol late at first grade not infrequently do belong to families from deprived socioeconomic background [49, 50].

Indeed, it is debatable whether conceptually there is a difference between a potential pure relative age effect and an age peer group effect. For example [51] show that a commonly postulated positive relationship between achievement and school entry age is primarily driven by the skills older children acquired prior rather than relative age effects. Further, [40] pointed out that children who were young relative to their kindergarten classmates generally performed no worse on achievement tests. This study, therefore, aimed to test the relative age effect premising on Ugandan boys and girls of primary three cohort.

1.3. Conceptual Framework

A child's age in comparison to the age of his or her peers (relative age) has been found to be an influential factor on his/her academic achievement [4, 7-9, 11, 15, 16]. Research findings suggest that significant gender differences may exist in terms of social or emotional development, behavioural regulation, and academic achievement among primary school pupils and may explain why girls outperform boys in early development measures [18], with boys consistently scoring lower than girls in both language and mathematics at lower primary school level [19, 20]. Also, a number of studies have found that exposure to higher-achieving or less-disruptive peers has benefits for a child's own achievement and behaviour [35, 36, 42, 43], while exposure to more disruptive peers can be detrimental [44-46] due to spill-over effect. Recent research on peer effects has found that girls are more responsive to higher-achieving peers than boys [38, 47].

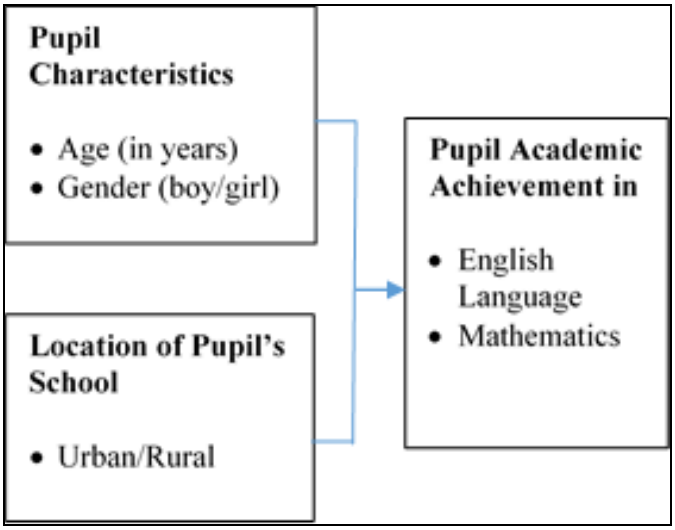

Fig 1: Conceptual framework for relative age effect on academic achievement at lower primary level.

1.4. Objectives of the Study

The study aimed to test the existence of relative age effect on academic achievement. Specifically, the study investigated the existence of relative age effect on mathematics and English language academic achievement while controlling for pupil characteristics and location of the school.

2. Materials and Methods

2.1. Data Source

The study used secondary data on progress in education, collected in the year 2015 by the National Assessment of Progress in Education (NAPE) of the Uganda National Examinations Board (UNEB). The dataset on primary three pupils, contained 24,043 data points on variables of interest including age (in years), gender (boy, girl), school location (urban, rural), region where school is found in Uganda (Northern, Eastern, Western, Southern, Kampala Capital City) and school ownership (public, private).

2.2. Data Analysis

The data on progress in education were analysed at univariate, bivariate and multivariate levels. At the univariate level, a descriptive summary of pupil and location characteristics using frequency distributions was done across academic achievement of the age groups: below median, median, and above median years of pupils age. Then, at bivariate level, academic achievement in both mathematics and English

Language by pupil and location characteristics was assessed using cross tabulation and associations were investigated using Pearson's chi-square test. Pearson's chi-square test is given by:

$$\chi^2 = \sum_{i=1}^{k} \sum_{j=1}^{n} \frac{(O_{ij} - E_{ij})^2}{E_{ij}} \quad (1)$$

Where, O_{ij} is the number of individuals observed in the i^{th} row and j^{th} column cell, E_{ij} is the number of individuals expected in the i^{th} row and j^{th} column cell; *k* is the number of categories of a given independent variable while *n* is the number of categories of the dependent variable.

For each plausible independent variable, this association was tested across the different age groups. The variables that were significant at the bivariate level were considered for further analysis.

At multivariate level, since the dependent variables, academic achievement for both mathematics and English Language were ordinal outcomes, ordered logistic regression models were fitted to assess the effect of pupil and location characteristics on academic achievements. This was done across the three different age groups in order to come up with a relative comparison of the magnitude of the effect of plausible independent variables on academic achievement in both English Language and mathematics.

$$\log\left(\frac{(Pr(y_i=j)}{(Pr(y_i=1)}\right) = \alpha_j + \beta_1 region_{east} + \beta_2 region_{kampala} + \beta_3 region_{north} + \beta_4 region_{west} + \beta_5 location_{rural} + \beta_8 gender_{girl} + \varepsilon_i \quad (2)$$

Where, $\alpha_1 < \alpha_2 < \cdots < \alpha_{k-1}$, $\beta_1 \ldots \beta_{11}$ are regression coefficients and ε_i the error term which follows a logistic distribution with mean 0 and variance $\pi^2/3$.

3. Results

The study found out that the median age for a primary three pupil was ten years. Accordingly, the Table 2 presents a descriptive summary of pupil and location characteristics using frequency distributions across academic achievement of the age groups below ten, ten, and ten year old pupils.

Table 2: Description of the pupils interviewed

Variables		Below Ten years		Ten years		Above Ten years	
		Freq.	**Percentage**	**Freq.**	**Percentage**	**Freq.**	**Percentage**
Location	Rural	5,134	74.27	6081	86.60	9,088	89.92
	Urban	1,779	25.73	941	13.40	1,019	10.08
Gender	Boys	2,899	41.94	3563	50.74	5,983	59.20
	Girls	4,014	58.06	3459	49.26	4,124	40.80
Mathematics	Inadequate	220	3.21	243	3.49	226	2.25
	Basic	1,249	18.23	1561	22.41	2,000	19.89
	Adequate	3,576	52.20	3838	55.10	5,775	57.43
	Advanced	1,805	26.35	1324	19.01	2,054	20.43
English Language	Inadequate	662	9.62	779	11.14	902	8.96
	Basic	1,487	21.61	1951	27.90	2,960	29.40
	Adequate	1,695	24.64	2172	31.06	3,575	35.51
	Advanced	3,036	44.13	2090	29.89	2,631	26.13
Region	Central	1,731	25.04	1372	19.54	1,713	16.95
	East	2,199	31.81	2263	32.23	2,368	23.43
	Kampala	306	4.43	76	1.08	81	0.80
	North	1,428	20.66	1744	24.84	2,994	29.62
	West	1,249	18.07	1567	22.32	2,951	29.20

From the Table 2, majority of pupils across all age groups were located in rural areas with 74.2%, 86.6% and 89.9% for below 10, 10 and above 10 years respectively. Most of the boys in primary three were above 10 years (59.2%) whereas most of the girls were below 10 years (58.06%). With regards to mathematics academic achievement, the majority attained adequate level, a level penultimate to the expected highest achievement level; notably, 57.43% of the above 10, 55.10% of the 10 and 52.20% of the below 10 year olds. As for English language academic achievement, the majority attained advanced level, which is the highest expected achievement; noted of 44.13% of the below 10, 29.89% of the 10 and 26.13% of the above 10 year olds. The interesting observation here is that, the older the pupil the better the performance in mathematics at primary three level while in English language the converse is the case.

In Table 3 we present results of the association between mathematics academic achievement by pupil and location characteristics.

Table 3: Association between plausible independent variables and mathematics academic achievement

			Mathematics Academic Achievement (%)			
Variables			**Inadequate**	**Basic**	**Adequate**	**Advanced**
Age	Below ten years		9.62	21.61	24.64	44.13
	Ten years		11.14	27.90	31.06	29.89
	Above ten years		8.96	29.40	35.51	26.13
			chi2(6) = 701.3036 Pr = 0.000			
Location	Below ten years	Rural	11.9	25.85	28.02	34.23
		Urban	3.05	9.38	14.86	72.71
			chi2(3) = 805.7136 Pr = 0.000			
	Ten years	Rural	12.11	29.12	31.43	27.34
		Urban	4.9	20.04	28.68	46.38
			chi2(3) = 162.2813 Pr = 0.000			
	Above ten years	Rural	9.56	30.51	35.92	24.01
		Urban	3.63	19.55	31.83	44.99
			chi2(3) = 231.6654 Pr = 0.000			
Gender	Below ten years	Boy	10.78	23.92	23.47	41.84
		Girl	8.79	19.95	25.48	45.78
			chi2(3) = 27.7899 Pr = 0.000			
	Ten years	Boy	11.19	28.78	30.86	29.17
		Girl	11.09	27.00	31.27	30.63
			chi2(3) = 3.3277 Pr = 0.344			
	Above ten years	Boy	8.85	29.13	36.13	25.90
		Girl	9.12	29.80	34.61	26.47
			chi2(3) = 2.4395 Pr = 0.486			
Region	Below ten years	Central	1.80	7.18	23.06	67.96
		East	15.38	29.15	24.44	31.03
		Kampala	0.00	0.66	6.25	93.09
		North	17.87	36.45	28.85	16.82
		West	3.30	16.56	26.85	53.30
			chi2(12) = 1.6e+03 Pr = 0.000			
	Ten years	Central	2.56	13.90	33.43	50.11
		East	16.97	33.72	29.41	19.90
		Kampala	0.00	3.95	22.37	73.68
		North	16.14	40.35	30.55	12.97
		West	5.25	19.13	32.37	43.25
			chi2(12) = 1.1e+03 Pr = 0.000			
	Above ten years	Central	3.22	18.68	37.41	40.69
		East	15.14	33.72	32.44	18.71
		Kampala	2.47	1.23	18.52	77.78
		North	12.14	38.04	34.82	14.99
		West	4.31	24.20	38.02	33.47
			chi2(12) = 971.0758 Pr = 0.000			

3.1. Age and mathematics academic achievement

There was a significant association ($p<0.05$) between age and mathematics academic achievement. Across all age groups, majority of the pupils had adequate academic achievement in mathematics; the highest (57.43%) being among the above 10, followed by 55.10% among the 10 and lastly 52.2% among the below 10 year olds.

3.2. Location and mathematics academic achievement across age groups

Across all age groups, there was a significant association ($p<0.05$) between location of the school a pupil attended and mathematics academic achievement. Attaining the advanced (highest) level achievement were pupils below 10 (46.35%) in contrast with their rural counterparts where the majority (55.38%) attained only adequate mathematics academic achievement.

3.3. Gender and mathematics academic achievement across age groups

The association between gender and academic achievement in mathematics was significant ($p<0.05$) only for pupils above 10 years but insignificant ($p>0.05$) for pupils aged 10 years and below. Majority of the pupils above 10 years attained adequate

academic achievement among both boys (57.24%) and girls (57.72%). In which case, girls demonstrated a slightly better performance.

3.4. Region and mathematics academic achievement across age groups

Across all age groups, there was a significant association (p<0.05) between the region where a pupils' school was situated and mathematics academic achievement. In Kampala, the majority of pupils below 10 years did attain advanced (65.03%) academic achievement in mathematics, in contrast with the rest of the regions, which attained only adequate achievement: Central (56.23%), West (55.28%), North (54.61%) and East (48.37%). The achievement pattern was similar in the other age groups.

The Table 4 presents academic achievement in both English language by pupil and location characteristics.

Table 4: Association between plausible independent variables and English language academic achievement.

			English Language Academic Achievement (%)			
Variables			**Inadequate**	**Basic**	**Adequate**	**Advanced**
Age	Below ten years		9.62	21.61	24.64	44.13
	Ten years		11.14	27.9	31.06	29.89
	Above ten years		8.96	29.4	35.51	26.13
			chi2(6) = 701.3036 Pr = 0.000			
Location	Below ten years	Rural	11.9	25.85	28.02	34.23
		Urban	3.05	9.38	14.86	72.71
			chi2(3) = 805.7136 Pr = 0.000			
	Ten years	Rural	12.11	29.12	31.43	27.34
		Urban	4.9	20.04	28.68	46.38
			chi2(3) = 162.2813 Pr = 0.000			
	Above ten years	Rural	9.56	30.51	35.92	24.01
		Urban	3.63	19.55	31.83	44.99
			chi2(3) = 231.6654 Pr = 0.000			
Gender	Below ten years	boy	10.78	23.92	23.47	41.84
		girl	8.79	19.95	25.48	45.78
			chi2(3) = 27.7899 Pr = 0.000			
	Ten years	boy	11.19	28.78	30.86	29.17
		girl	11.09	27	31.27	30.63
			chi2(3) = 3.3277 Pr = 0.344			
	Above ten years	boy	8.85	29.13	36.13	25.9
		girl	9.12	29.8	34.61	26.47
			chi2(3) = 2.4395 Pr = 0.486			
Region	Below ten years	Central	1.8	7.18	23.06	67.96
		East	15.38	29.15	24.44	31.03
		Kampala	0	0.66	6.25	93.09
		North	17.87	36.45	28.85	16.82
		West	3.3	16.56	26.85	53.3
			chi2(12) = 1.6e+03 Pr = 0.000			
	Ten years	Central	2.56	13.9	33.43	50.11
		East	16.97	33.72	29.41	19.9
		Kampala	0	3.95	22.37	73.68
		North	16.14	40.35	30.55	12.97
		West	5.25	19.13	32.37	43.25
			chi2(12) = 1.1e+03 Pr = 0.000			
	Above ten years	Central	3.22	18.68	37.41	40.69
		East	15.14	33.72	32.44	18.71
		Kampala	2.47	1.23	18.52	77.78
		North	12.14	38.04	34.82	14.99
		West	4.31	24.2	38.02	33.47
			chi2(12) = 971.0758 Pr = 0.000			

3.5. Age and English language academic achievement

There was a significant association ($\chi^2_{(6)} = 701.30;\ p = 0.00$) between age and academic achievement in English language. The highest proportion of pupils aged 10 years (31.06%) and above 10 years (35.51%) attained adequate academic achievement in English language, though the highest academic achievement in English language (44.13%) was among the

below 10, followed by 29.89% among the 10 and lastly 26.13% among the above 10 year olds.

3.6. Location and English language academic achievement across age groups

Across all age groups, there was a significant association ($p < 0.00$) between location of the school a pupil attended and academic achievement in English Language. The majority of pupils below 10 years in urban areas attained advanced (highest) English language academic achievement (72.71%) in contrast with their rural counterparts with just 34.23 %. As for pupils aged 10 years, the highest proportion in rural areas (31.43%) attained adequate academic achievement in contrast with their urban counterparts (46.38%) who attained advanced academic achievement. There was no significant difference for pupils aged above 10 years across both rural (35.92%) and urban (44.99%) areas.

3.7. Gender and English language academic achievement across age groups

The association between gender and English language academic achievement was significant (p<0.05) only for pupils below 10 years but insignificant (p>0.05) for pupils aged 10 years and above. The below 10 year olds who attained advanced (highest) English language academic achievement were, boys (41.84%) and girls (45.78%). This indicates that, at primary three, girls are slightly better than boys in English language achievement.

3.8. Region and English language academic achievement across age groups

Across all age groups, there was a significant association (p<0.05) between the region where a pupils' school was situated and English language academic achievement. Majority of pupils below 10 years in Kampala (93.09%), Central (67.96%) and West (53.3%) attained advanced (highest) academic achievement in English language, in contrast with the other regions. Similarly for pupils aged 10 years, Kampala had the highest majority attaining advanced (highest) English language academic achievement (73.68%) followed distantly by Central (50.11%) while the other regions including East (19.9%), North (12.97%) and West (43.25%) were below average. Even for pupils aged above 10 years, Kampala (77.78%) still registered the majority of pupils in the advanced (highest) English language academic achievement while other regions performed below average: Central (40.69%), West (33.47%), East (18.71%), and North (14.99%).

The Table 5 presents an assessment of the effect of pupil and location characteristics on academic achievement across age groups to depict relative comparison of the magnitude of the effect of plausible independent variables on mathematics academic achievement.

Table 5: Determinants of mathematics academic achievement among pupils in lower primary

	Less than Ten Years	Ten Years	Above Ten Years
Variables	Odds Ratio	Odds Ratio	Odds Ratio
Location			
Urban	1.000	1.000	1.000
Rural	0.368**	0.538**	0.475**
Gender			
Boy	1.000	1.000	1.000
Girl	0.956	0.923	0.826**
Region			
Central	1.000		
East	0.292**	0.325**	0.402**
Kampala	1.566**	1.754**	1.679**
North	0.217**	0.313**	0.487**
West	0.831**	0.954	0.944

** implies significant with p< 0.05

From Table 5, location and region had a significant effect (p<0.05) on academic achievement in mathematics across all age groups whereas gender only had a significant effect for pupils aged above 10 years.

3.9. Effect of location on mathematics academic achievement across age groups

For pupils aged below 10 years in rural areas, the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 0.37 times lower than for students in urban areas, other variables held constant.

As for pupils aged 10 years in rural areas, the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 0.54 times lower than for students in urban areas, other variables held constant.

Similarly, for pupils aged above 10 years in rural areas, the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 0.48 times lower than for students in urban areas, other variables held constant.

3.10. Effect of gender on mathematics academic achievement across age groups

For girls aged above 10 years, the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 0.83 times lower than for boys, other variables held constant.

3.11. Effect of region on mathematics academic achievement across age groups

For pupils aged below 10 years from the East, the odds of attaining advanced academic achievement in mathematics

versus the combined adequate, basic and inadequate academic achievement were 0.29 times lower than for students in the Central region, other variables are held constant. Kampala: the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 1.57 times higher than for students in the Central region, other variables held constant. The North: the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 0.22 times lower than for students in the Central region, other variables held constant. The West: the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 0.83 times lower than for students in the Central region, other variables held constant.

As for pupils aged 10 years from the East, the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 0.33 times lower than for students in the Central region, other variables held constant. Kampala: the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 1.75 times higher than for students in the Central region, other variables held constant. The North: the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 0.31 times lower than for students in the Central region, other variables held constant.

Similarly, for pupils aged above 10 years; from the East, the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 0.40 times lower than for students in the Central region, other variables held constant. Kampala: the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 1.68 times higher than for students in the Central region, other variables held constant. The North: the odds of attaining advanced academic achievement in mathematics versus the combined adequate, basic and inadequate academic achievement were 0.49 times lower than for students in the Central region, other variables held constant.

The Table 6 presents an assessment of the effect of pupil and location characteristics on academic achievement across age groups to depict relative comparison of the magnitude of the effect of the plausible independent variables on English language academic achievement.

Table 6: Determinants of English language academic achievement among pupils in lower primary.

	Less than Ten Years	**Ten Years**	**Above Ten Years**
	<10 years	**10 years**	**>10 years**
Variables	Odds Ratio	Odds Ratio	Odds Ratio
Location			
Urban	1.000	1.000	1.000
Rural	0.229**	0.414**	0.370**
Gender			
Boy	1.000	1.000	1.000
Girl	1.161**	1.081	1.002
Region			
Central	1.000	1.000	1.000
East	0.176**	0.208**	0.287**
Kampala	2.327**	1.506	2.502**
North	0.104**	0.159**	0.263**
West	0.557**	0.709**	0.751**

** implies significant with $p < 0.05$

3.12. Effect of location on academic achievement (English Language) across age groups

For pupils aged below 10 years in rural areas, the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement were 0.23 times lower than for students in urban areas, other variables held constant.

As for pupils aged 10 years in rural areas, the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement were 0.41 times lower than for students in urban areas, other variables held constant.

Similarly, for pupils aged above 10 years in rural areas, the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement were 0.37 times lower than for students in urban areas, other variables held constant.

3.13. Effect of gender on academic achievement (English Language) across age groups

For girls aged below 10 years, the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement were 1.16 times higher than for boys, other variables held constant.

3.14. Effect of region on academic achievement (English Language) across age groups

For pupils aged below 10 years from; the East, the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement were 0.18 times lower than for students in the Central region, other variables held constant. Kampala: the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement were 2.33 times higher than

for students in the Central region, other variables held constant. The North: the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement were 0.10 times lower than for students in the Central region, other variables held constant. The West: the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement were 0.56 times lower than for students in the Central region, other variables held constant.

As for pupils aged 10 years from; the East: the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement were 0.21 times lower than for students in the Central region, other variables held constant. The North: the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement are 0.16 times lower than for students in the Central region, other variables held constant. The West, the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement are 0.71 times lower than for students in the Central region, other variables held constant.

Similarly, for pupils aged above 10 years from; the East: the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement are 0.29 times lower than for students in the Central region, other variables held constant. Kampala: the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement are 2.50 times higher than for students in the Central region, other variables held constant. The North: the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement are 0.26 times lower than for students in the Central region, other variables held constant. The West, the odds of attaining advanced academic achievement in English Language versus the combined adequate, basic and inadequate academic achievement are 0.75 times lower than for students in the Central region, other variables held constant.

4. Discussion

This study tested existence of relative age effect in relation to academic achievement; specifically investigating existence relative age effect in mathematics academic achievement and English language academic achievement; on the basis of pupil characteristics and location of pupil's school.

The study observed that, the older the pupil the better the performance in mathematics at primary three level while in English language the converse is the case. Hence, RAE exists, in concurrence with [2-13]; particularly in academic achievement, in consonance with [4-6]. The RAE depends on the area of endeavour; as this study demonstrated that at primary three level, the older the pupil the better the performance in mathematics; while the converse is the case in English language academic achievement.

In mathematics academic achievement at primary three level (where median age was 10 years), the findings of this study agrees with [11] that older children do outperform their younger counterparts. However, in English language academic achievement, according to this study, the converse was the case; indicating that the finding by [11] does not hold in all cases. The likely explanation here is that language learning is vehement at a younger age though this should not necessarily imply that the language learnt will have been lost soon after such that the older one is the poorer one performs in language achievement test but it is more probable that the passion of language learning gives way to more challenging cognitive demands such as mathematics learning or more cognitive resources get shifted from language to mathematics focus.

According to [18], significant gender differences apparently exist whereby, according to [19, 20], boys consistently score lower than girls in both language and mathematics at lower primary school level; which this study confirmed. Apparently, this is because boys do not mature as quickly as girls as pointed out by [21-25, 31, 32]. In general, this agrees with [38, 47] that girls are more responsive to higher-achieving peers than boys; suggesting that being relatively young in a cohort may be more beneficial to girls.

5. Conclusion

This study tested for existence of relative age effect (RAE) on academic achievement at lower primary where median age was 10 years. Specifically, the study investigated the RAE in mathematics and English language academic achievement, on the basis of pupil characteristics and location of pupil's school.

Findings from this study strongly suggest that RAE exists in relation to academic achievement. In mathematics academic achievement, the older the pupil the better the performance while in English language the younger pupils performed better. The likely explanation here is that language learning is vehement at a younger age. With regards to the RAE, significant gender differences exist, whereby; boys consistently score lower than girls in both language and mathematics at lower primary school level. This likely explanation is that boys do not mature as quickly as girls and, apparently, girls are more responsive to higher-achieving peers than boys. This suggests that being relatively young in a cohort may be more beneficial to girls than boys.

The following recommendations are based on results of this study; firstly, to group children into a cohort so that they study together subjects them to un-called for relative age effect that may disadvantage their academic achievement. Therefore, the age range of the children grouped should be minimal and not to exceed 12 months. Secondly, gender difference should be acknowledged, so that girls and boys study separately to provide for better targeting and sequencing of academic content.

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