Is There a Relationship Between the Birth-Date and Entering the University?

J. Zubero[1], S. M Gil[2], A. Irazusta[3], I. Hoyos[3] and J. Gil[*,1]

[1]*Department of Physiology. Faculty of Medicine and Dentistry, University of the Basque Country, P.O. Box 699, E-48080 Bilbao, Bizkaia, Spain*

[2]*Faculty of Physical Activity and Sports Sciences, University of the Basque Country, Lasarteko Atea z/g, 01007, Vitoria-Gasteiz, Alava, Spain.*

[3]*Department of Nursing I. Nursing University School, University of the Basque Country, P.O. Box 699, E-48080 Bilbao, Bizkaia, Spain*

Abstract: The purpose of this study was to evaluate whether the "date of birth" influences the process of gaining access to university. To this end, we considered the distribution of the birth dates during the year, the qualifications required to enter the University of the Basque Country and the selected degree of 32,740 students who had entered the University from 1999 to 2004. Correlation analysis demonstrated that there is a small (r=-0.015) but significant (p=0.011) relationship between date of birth (January 1st =1; December 31st = 365) and the average grade students obtained in their university admittance exams. Moreover, this difference is more marked in certain degrees such as Medicine, Audiovisual Communication, Psychology, Engineering, Fine Arts or Physical Education. The effect may be due to a different degree of maturity between the adolescents born in January and those born in December. Thus, the former may be more mature and obtain better qualifications in secondary school. In conclusion, the data suggest that the "date of birth" factor influences the process of gaining access to university. Therefore special attention should be made to avoid the potential disadvantages associated with being born late in the year.

INTRODUCTION

Nowadays it is well accepted that people born in the first half of the selection year have more chances of being successful in certain sports [1, 2]. This has been attributed to the fact that older children have physical advantages in many sports compared with their younger counterparts [3].

In the same way, professionals working in the field of education have long been aware that the youngest children in a school year tend to be disadvantaged by the educational system, particularly in the earlier years of school [4-7].

Different explanations of age-related differences in school performance have been proposed. Firstly, that they are related to differences in length of schooling [8]. Secondly, that there may be an age-position effect produced by variables associated with the fact that some children in a year-group are older that their peers [9-11]. In Spain, and most western countries, where all children born in the same calendar year enter school at the same time, the oldest and youngest pupils may differ in age by nearly one full year.

As different countries use different cut-off dates for school entry, national comparisons are illuminating. Whereas children born between September and December are at an advantage in England, where they are the oldest in their class, children born in these months are at a disadvantage in Sweden, where they are the youngest in their class [9, 12, 13]. This is strong evidence for the age-position effect explanation, based on the disadvantage of the youngest children in the year, who may not be developmentally ready to start school and may suffer stress and failure in the school environment [5].

The educational disadvantage experienced by the youngest children in a class is not confined to the early school years but persists into secondary education [10, 14] and it also influences university entrance [5, 8]. But while there are numerous studies that examine the age effect in primary and secondary education, there are very few studies that analyze this effect in university education and in addition these works are very specific, limited to a specific degree, and carried out with a small community sample. Thus, a constant asymmetry in the birth date distribution of the Portuguese and Italian faculties of medicine has been observed [15, 16].

These studies have led us to investigate whether the birth date asymmetry appears generally in all subjects studied at university or occurs selectively in specific courses of study, and whether it is the same among males and females. In addition, we investigate whether there is any correlation between birth date distribution and qualifications to enter the University.

METHOD

Sample

We considered the distribution of the birth dates throughout the year and the qualifications required to enter the University of the Basque Country for 32 740 students who had entered the University from 1999 to 2004. The subjects were born between 1980 and 1985. The mean age when they entered the Basque Country University was 18 years

*Address correspondence to this author at the Department of Physiology. Faculty of Medicine and Dentistry, University of the Basque Country, P.O. Box 699, E-48080 Bilbao, Bizkaia, Spain;
E-mail: javier.gilgoikouria@ehu.es

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(S.D.=0.64). The current study examined data from 19 513 women and 13 227 men. These dates were obtained from the University Register.

The University of the Basque Country (UPV/EHU), the only public university in the Basque Country, is one of the biggest universities in Spain, with around 50 000 students, and has the widest educational offer, with around one hundred degree courses. This University is the biggest in the Basque Country and around 75% of Basque Country university students attend the UPV/EHU.

Birth date distribution of the students who entered the University of the Basque Country was compared with the birth date distribution of the Basque Country General Population born between 1980 and 1985. The data for the Basque Country General Population was collected from EUSTAT (Official Basque Statistics Office).

Ethics

The study was approved by the Research and Ethics Board of the University of the Basque Country Medical School.

Measures

Season of Birth

The main predictor variable in this study was season of birth.

In Spain, students are distributed in courses according to the calendar year and the cut-off date for school entry is 31st December. So in a specific class people born during the first months of the year (January-March) are the oldest ones and the people born during the last months of the year (October-December) are the youngest.

In the present work the season of birth was defined as the distribution of the date of birth throughout the year. The selected distribution ranges were: Distribution of people in birth date semesters (1st semester [January-June]; 2nd semester [July-December]), birth date quarters (1st quarter [January-March]; 2nd quarter [April-June]; 3rd quarter [July-September]; 4th quarter [October-December]) and birth date months and days.

Qualifications

To enter any of the Spanish universities it is necessary to pass an entrance exam. The score obtained in this exam (40% of the value) is added to the marks obtained during Secondary Education (60% of the value) and this gives a mark called "selectividad", which is the score used for the purposes of university entrance and choosing candidates for specific courses of study, specially those with *numerous clausus.*

The *numerous clausus* (programmed number) was introduced to limit access to some courses. Thus entrants to specific faculties, such as the medical faculty, are the most successful high school students, due to the scarcity of places as compared to the number of interested applicants.

Methods of Analysis

Data were analyzed statistically using SPSS® 15.0. Chi-square analysis was used to determine whether the percentage differences between the birth date distribution ranges were statistically significant. Correlation analyses were calculated using Pearson correlation coefficients. An alpha of $p \leq 0.05$ was used for statistical significance.

RESULTS

Table **1** shows the distribution of people, born between 1980 and 1985, in birth date semesters for the Basque Country General Population and the students that entered the University of the Basque Country. The χ^2 test indicated that the distribution of the birth dates was different for university students compared to the general population of the same age, with the proportion of people born in the first semester being larger in the university population ($p<0.001$). If we analyze the gender effect, we can notice that although this distribution asymmetry is similar in both genders, with a higher proportion of both males and females born in the first semester, it presents a higher significance among males ($p<0.001$) than among females ($p<0.005$). The analysis revealed the same asymmetry over the whole six-year period.

The distribution of people born in the first and the second semesters of the year in the Basque Country and in the main degrees offered by the University of the Basque Country is presented in Table **2**. We can observe that the difference between the number of students born in each semester is more marked in certain degrees such as Medicine ($p<0.005$), Industrial Engineering ($p<0.05$), Technical Engineering ($p<0.05$), Audiovisual Communication ($p<0.01$), Psychology ($p<0.05$), Psychopedagogy ($p<0.05$), Physical Education ($p<0.01$) or Fine Arts ($p<0.05$), where the differences are significant.

In those studies in which significant differences were observed, if we compared the distribution of people born in the first and the second semesters of the year in the Basque Country with all the students registered, we then analyzed their distribution by gender (Table **3**). Among the Medicine

Table 1. Distribution of people in birth-date semesters in the Basque Country and in the University of the Basque Country

Birth-Date Semesters	General Population Population			University Students		
	Total	Males	Females	Total	Males	Females
1st semester (Jan-Jun)	76,904	39,822	37,082	17,272	6,998	10,276
2nd semester (Jul-Dec)	72,104	37,437	34,697	15,469	6,229	9,237
Total (number)	149,038	77,259	71,779	32,740	13,227	19,513
Total (%)	100 %	51.8 %	48.2 %	100 %	40.4 %	59.6 %
χ^2				P < 0.001	P < 0.005	P < 0.05

Table 2. Distribution of People Born in the First and the Second Semesters of the Year in the Basque Country General Population, from the University of the Basque Country and from the Selected Degree Courses

		1st Semester	2nd Semester	χ^2
Basque Country General Population (18-24) years		**76 904**	**72 104**	
University of the Basque Country (All)		**17 272**	**15 469**	**P < 0.001**
Experimental Sciences	Degree in Biology	492	483	n.s.
	Degree in Biochemistry	42	33	n.s.
	Degree in Environmental Sciences	131	124	n.s.
	Degree in Physics	124	108	n.s.
	Degree in Geology	123	118	n.s.
	Degree in Mathematics	74	80	n.s.
	Degree in Chemistry	421	358	n.s.
Health Sciences	Degree in Pharmacy	337	339	n.s.
	Degree in Medicine	590	455	P < 0.005
	Degree in Dentistry	135	125	n.s.
	Diploma in Nursing	359	375	n.s.
	Diploma in Human Nutrition and Dietetics	136	113	n.s.
Technical Studies	Degree in Architecture	398	410	n.s.
	Diploma in Technical Architecture	58	61	n.s.
	Degree in Telecommunication Engineering	307	271	n.s.
	Degree in Computer Engineering	372	349	n.s.
	Degree in Industrial Engineering	719	594	P < 0.05
	Degree in Chemical Engineering	268	247	n.s.
	Diploma in Technical Engineering	2874	2536	P < 0.05
	Diploma in Maritime Navigation	36	41	n.s.
Social Sciences	Degree in Political Sciences	122	128	n.s.
	Degree in Audiovisual Communication	202	141	P < 0.01
	Degree in Pedagogy	105	89	n.s.
	Degree in Journalism	555	485	n.s.
	Degree in Psychology	547	450	P < 0.05
	Degree in Psychopedagogy	103	67	P < 0.05
	Degree in Publicity and Public Relations	301	255	n.s.
	Degree in Sociology	112	116	n.s.
	Diploma in Social Education	348	379	n.s.
	Diploma in Social Work	138	118	n.s.
	Diploma in Teaching	1363	1356	n.s.
	Degree in Sports Sciences	193	146	P < 0.01
Legal Sciences	Degree in Law	545	482	n.s.
Economic Sciences	Degree in Economics	471	392	n.s.
	Degree in Business Administration	1321	1266	n.s.
	Diploma in Business Sciences	1314	1194	n.s.
Humanities	Degree in Fine Arts	621	483	P < 0.05
	Degree in Philology	315	284	n.s.
	Degree in Philosophy	58	57	n.s.
	Degree in Geography	38	31	n.s.
	Degree in History of Art	95	75	n.s.
	Degree in History	130	110	n.s.
	Degree in Translation	132	103	n.s.
	Degree in Anthropology	17	20	n.s.

($p<0.001$) and Engineering ($p<0.05$) students we observed significant differences in the case of the male students and not in the case of the female students. In Audiovisual Communication, significant differences are found among female students and not among male students ($p<0.05$). For the Psychology and Physical Education students, significant differences are not observed when analyzing the groups of students by sexes. However, among Fine Arts students we can observe a significant difference both in the male student group ($p<0.05$) and in the female student group ($p<0.05$).

The minimum score in the university admittance exam (*selectividad*) required to enter, and the number of places offered on the selected degree courses, for those studies in which there were observed significant differences, are illustrated in Table **4**. We can emphasize that the two degree

courses with the greatest minimum entrance mark are Medicine and Audiovisual Communication.

Table 3. Distribution, by Gender, of People Born in the First and the Second Semesters of the Year in the Basque Country, at the University of the Basque Country and on the Selected Degree Courses

		n	1st Semester	2nd Semester	χ^2
Medicine Students	All	1045	590	455	P < 0.005
	Male	212	134	78	P < 0.001
	Female	833	456	377	P = 0.077
Industrial Engineering Students	All	1313	719	594	P < 0.05
	Male	942	516	426	P < 0.05
	Female	371	203	168	P = 0.131
Technical Engineering Students	All	5291	2816	2475	P < 0.05
	Male	3843	2036	1807	P = 0.082
	Female	1448	780	668	P = 0.099
Audiovisual Communication Students	All	343	202	141	P < 0.01
	Male	89	51	38	P = 0.277
	Female	254	151	103	P < 0.05
Psychology Students	All	997	547	450	P < 0.05
	Male	141	80	61	P = 0.217
	Female	856	467	389	P = 0.092
Psychopedagogy Students	All	170	103	67	P < 0.05
	Male	18	13	5	P = 0.079
	Female	152	90	62	P = 0.062
Physical Education Students	All	387	231	156	P < 0.05
	Male	145	85	60	P = 0.081
	Female	242	146	96	P = 0.213
Fine Arts Students	All	1104	621	483	P < 0.005
	Male	288	169	119	P < 0.05
	Female	816	452	364	P < 0.05

Table 4. Minimum Score Required, During the Secondary School Study Period, to Gain Admittance and the Number of Places Offered in the Selected Degrees

Degree	Required Score (Range)	Places Offered
Degree in Medicine	7.73 – 8.04	200
Degree in Industrial Engineering	5.00 – 5.06	300
Diploma in Technical Engineering	5.00 – 5.78	400
Degree in Audiovisual Communication	7.27 – 7.77	75
Degree in Psychology	5.00	285
Degree in Psychopedagogy	5.00	50
Degree in Sports Sciences	6.00 – 6.50	100
Degree in Fine Arts	5.04 – 5.06	285

Table **5** presents the correlation among birth date day, birth date quarter, birth date semester and the qualifications obtained to enter the University. Regression analysis demonstrated that there is a small (r=-0.015) but significant (p<0.01) relationship between date of birth (January 1st =1; December 31st = 365) and the average grade students obtained in their university admittance exams (the average between the final grade from secondary school and the grade in the university admittance exam). In male students this correlation was also statistically significant (p=0.05). In female students the correlations were non-significant. If we analyze the correlation between the birth date month, birth date quarter and birth date semester and the qualifications, the results are maintained. In female students this correlation was not statistically significant.

Table 5. Correlations Between the Birth Date Day, Birth Date Month, Birth Date Quarter and Birth Date Semester of the Students of the Basque Country University and the Scores Obtained for Entry to the University

Basque Country University	Birth Date Day	Birth Date Month	Birth Date Quarter	Birth Date Semester
All students	R = -0.015 P < 0.01	R = -0.016 P < 0.005	R = -0.015 P < 0.01	R = -0.019 P = 0.001
Male students	R = -0.022 P < 0.05	R = -0.023 P < 0.01	R = -0.022 P < 0.05	R = -0.26 P < 0.01
Female students	R = -0. 012 P < 0.14	R = -0. 011 P < 0.13	R = -0. 011 P < 0.12	R = -0. 015 P < 0.05

DISCUSSION

Our results showed that the distribution of the birth dates was different for university students compared to the general population of the same age, with the proportion of people born in the first semester being larger in the university population, demonstrating that the relative age effect is present even at the university stage, thereby confirming and extending previous findings [5], using a large sample of 32,740 students. This study supports the theory that there may be a "season effect" whereby fewer second semester-born students enter the University.

As has been observed in studies carried out among primary and secondary school students [9, 13, 14, 17, 18] we demonstrated that there is a small but significant relationship between season of birth, as a reflection of age position within the school year, and the average mark students obtained in their university admittance exams (the average between the final grade from secondary school and the mark in the university admittance exam). So, the oldest adolescent in each cohort performed better academically.

The effect may be due to a different degree of maturity between the adolescents born in January and those born in December. Thus, these studies support the theory that says that the former may be more mature and obtain better qualifications in secondary school [9, 13,18]. In this regard it is interesting to note that this effect is more significant in boys than in girls. This may be due to the later maturation of boys

[19] that could give more significance to the relative age effect in secondary school to the male students.

When analyzing student admittance based on sex, we observed a greater proportion of women among the university students (59.6 % of the university students) than in the general population (48.2 % of the Basque Country General Population). This could be partially explained by the existence of studies proving that girls consistently outperform boys in scholastic attainment in primary and secondary studies [6], meaning that in the end a disproportionately greater proportion of women gains admittance to university. In addition, a study of the birth dates, sex and cognitive abilities of children with special educational needs showed that males were significantly over-represented compared to females [20].

When we compared the age effect in the courses of study offered by the University of the Basque Country, we found that this relative age effect is significant for the following courses: Medicine, Industrial Engineering, Technical Engineering, Audiovisual Communication, Psychology, Psychopedagogy, Sport Sciences and Fine Arts. This relative age-effect is particularly relevant for Medicine and Audiovisual Communication degrees, which are courses with tight limitations on the number of incoming students, for which the minimum scores required in the entrance exam are the highest among all the courses offered by our university. This asymmetric birth date distribution could be due to the relationship between season of birth and the score obtained in their university admittance exams. So, the oldest adolescent in each cohort, those born in the first semester, performed better in the admittance exam and gained places on the degree courses with higher minimum scores required. There are two previous studies, using a similar methodology, showing an asymmetric birth date distribution of students entering the Faculty of Medicine in Portugal [15] and Italy [16]. The first one was made with the birth-dates of 263 medical students and the second one with 957 medical students. As in our country, in these countries medical students are among the most successful high school students.

When analyzing patterns between the sexes, we can observe that Medicine or Audiovisual Communication degree courses, the ones requiring higher access marks, have a higher percentage of female students. This could be partly explained by a feminine tendency to perform better than males [6].

Industrial Engineering and Technical Engineering are also courses for which the relative age effect is particularly relevant. These courses do not place limitations on the number of incoming students and a minimum score in the entrance exam is not required to study them. In these cases the asymmetric age distribution could be explained by the specific abilities in mathematics required in these studies. Analyses based on a data set consisting of mathematics scores showed a strong and consistent age effect: the 'oldest' pupils in an age class were better in mathematics than the 'youngest' pupils [6, 20- 22].

Specific social abilities, like communication skills or reading ability required for Psychology and Psychopedagogy studies, could explain the birth date distribution differences observed for these courses. Previous works have reported that the oldest pupils in a year group perform better both in reading ability and communication skills than their counterparts [22, 23].

The significant asymmetric birth date distribution in those courses for which special skills are needed, such as Fine Arts or Physical Education, is very interesting. Moreover, we should not discard the idea that at very young ages, children who are almost one year older are better at drawing, painting and playing sports, and this may increase confidence and enhance their motivation to develop an interest in arts or sport.

CONCLUSIONS

In conclusion, this study showed a significant correlation between date of birth and academic performance, suggesting that the "date of birth" factor influences the process of gaining access to university.

Therefore special efforts should be made during the primary and secondary education to avoid the potential disadvantages associated with being born late in the year. Teachers should take into account the birth-date when assessing the ability of pupils in their class increasing the possibilities of people born in the second semester to enter the university.

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