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# IQs in Italy are higher in the north: A reply to Felice and Giugliano

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ABSTRACT

Criticisms advanced by Felice and Giugliano (2011) of the thesis that IQs in Italy are higher in the north than in the south are answered and new data confirming the thesis are given from the PISA 2009 study and for math and reading abilities in the recent INVALSI study. New genetic data are given showing higher frequency of blond hair the haplogroup xR1 allele and the haplogroup E1b1b allele as markers for greater percentage northern and central European ancestry in northern Italian regions.

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## 1. Introduction

My paper proposing that IQs in Italy are highest in the north and lowest in the south (Lynn, 2010a) has generated some controversy. The paper proposed that these regional IQs differences explain the long standing problems of the differences in average incomes, literacy, education, stature, infant mortality and the numbers of individuals who have achieved eminence in the arts and sciences incomes, and that they are attributable to immigration from North Africa and the Middle East in the more southerly regions, whose genetic legacy has been to reduce the IQs of the populations. This thesis has been criticised by Beraldo (2010) and by Cornoldi, Belacchi, Giofre, Martini, and Tressoldi (2010), and these criticisms have been answered by Lynn (2010b). Now Felice and Giugliano (2011) have advanced four further criticisms. The purposes of this paper are to answer their criticisms and to present new data confirming the existence of north–south IQs differences in Italy and their genetic basis.

## 2. Reply to Felice and Giugliano

The four criticisms of the north–south Italian IQs differences advanced by Felice and Giugliano (2011) are (1) "the evidence presented by the author is not sufficient to say that the IQ of Southern Italians is lower than the one of Northern Italians" and they reiterate the argument that PISA scores for reading comprehension, mathematics and science are measures of educational attainment determined by school differences and not of intelligence. I have answered this point in Lynn (2010a, 2010b) but will not repeat these answers here except to note that the PISA tests do not measure knowledge of the curriculum but of understanding and hence of intelligence; that educational attainment is so highly correlated with intelligence in individuals and populations that any measure of it is necessarily also a measure of intelligence in individuals and populations; that across 108 national populations PISA scores are correlated with IQs at $r = 1.0$ (Lynn & Meisenberg, 2010); and that it has been shown by Haworth, Asbury, Dale, and Plomin (2011) in a study of 4000 pairs of 12-year-old twins in the UK that school differences account for only a small percentage of the variance in educational attainment (12%). The major effects are genetic (50%) and shared environmental influences (25%), i.e., family influences that twins share.

(2) "The analysis does not prove that there is any causal inference between what is described as IQ and any of the variables mentioned." It is difficult to prove causality in the social sciences or, according to purists, in any science. The best that can be done is to propose hypotheses that appear to provide the most reasonable explanation of the data. The

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scientific community must then judge between competing hypotheses. For the present set of problems, it is considered that there are no plausible competing hypotheses because the alternative proposed by Felice and Giugliano that the regional differences in PISA, average incomes and other phenomena are attributable to differences in educational resources beg the question of why all of these are poorer in the south and are highly correlated with latitude, for which they are unable to provide an answer.

(3) "There is no evidence that the alleged differences in IQ are persistent in time and therefore attributable to genetic factors." They assert that in classical times the Greek colony in Sicily produced people like Pythagoras and Archimedes and was more advanced than the center and north culturally, technologically and probably economically and hence "if there was any relation between race and culture, it goes in the opposite direction of the one envisaged by Lynn, at least until the low middle ages." This criticism misses the point that the theory advanced in Lynn (2010a) is that it was the Arab occupation of Sicily and the southern mainland of Italy during the eighth to the eleventh centuries that introduced North African genes into the population and has been responsible for the lower IQs and poorer economic and cultural development. Thus, the criticism that regional differences in intelligence present in Italy today cannot explain historical differences in per capita income and cultural achievements in classical times and the first millennium does not invalidate the theory that they can do so from the early middle ages up contemporary times.

(4) Felice and Giugliano's (2011) final point is that the greater admixture of North African ancestry in southern Italy has no relevance for the lower IQs, earnings, educational attainment and other variables. Contrary to this contention, an association between the percentage of North African ancestry and lower IQs, earnings, educational attainment and other variables is predictable from the lower values of these variables throughout North Africa and the Near East documented by Lynn and Vanhanen (2006).

## 3. The 2009 PISA study

We now present new data showing that IQs are higher in the north of Italy than in the south. In the previous study, data were presented for 12 Italian regions from the PISA (Program for International Student Assessment) 2006 study of the reading comprehension, mathematics and science performance of 15 year olds, regarded as measures of intelligence. We are now able to give similar data on the reading comprehension, mathematics and science performance of 15 year olds in 20 Italian regions obtained in the 2009 PISA study (OECD, 2010). These are given in Table 1. This shows, reading from left to right, the latitude of the Italian regions, the mean PISA scores for 12 regions for 2006 given in Lynn (2010a), the mean scores of 15 year olds on reading comprehension, mathematics and science understanding for the 20 Italian regions obtained in the 2009 PISA study, and the averages of the three 2009 PISA scores given because it provides a convenient summary of the scores on the three tests.

The correlations between these variables are given in Table 2. This shows that the high correlation between PISA 2006 average scores and latitude (.97) previously reported for 12 regions is confirmed by the PISA 2009 scores for 20 regions. The average of the PISA 2009 scores is correlated with latitude at .91. The PISA 2009 data make it possible to calculate the reliability of the PISA scores from the correlation between the average 2006 and the average 2009 scores, for which $r = .89$, showing that the PISA data have high reliability.

## 4. The INVALSI survey

New data for abilities in math and language comprehension of school students in five Italian regions have become available in the INVALSI (2011) survey. This survey consisted of tests of math and of knowledge and comprehension in the Italian language for five age groups. The survey involved a total of 14,400 schools, 112,500 classes and 2,250,000

**Table 1**
Descriptive statistics for regional differences in Italy.

| Region | Latitude | PISA 2006 | PISA 2009 Reading | PISA 2009 Math | PISA 2009 Science | PISA 2009 Average | Blond hair % | xR1a | E1b1b |
|---|---|---|---|---|---|---|---|---|---|
| Friuli VG | 46.00 | 522 | 513 | 510 | 524 | 516 | 17.5 | – | – |
| Trentino | 46.00 | 512 | 508 | 514 | 523 | 515 | 17.5 | 67.40 | 6.00 |
| Veneto | 45.50 | 515 | 505 | 508 | 518 | 510 | 12.9 | 45.50 | – |
| Lombardy | 45.00 | 515 | 522 | 516 | 526 | 521 | 10.6 | 61.10 | – |
| Valle D'Aosta | 46.00 | – | 514 | 502 | 521 | 512 | 22.5 | – | – |
| Piedmont | 45.00 | 502 | 496 | 493 | 501 | 497 | 15.0 | – | – |
| Emilia-Romagna | 44.50 | 500 | 502 | 503 | 508 | 504 | 7.5 | – | – |
| Marche | 43.50 | – | 499 | 499 | 504 | 501 | 8.0 | – | – |
| Liguria | 44.50 | 481 | 491 | 491 | 498 | 493 | 7.5 | 46.60 | – |
| Toscana | 43.50 | – | 493 | 493 | 500 | 495 | 4.6 | 58.40 | 6.50 |
| Umbria | 43.00 | – | 490 | 486 | 497 | 491 | 9.0 | – | – |
| Lazio | 41.50 | – | 481 | 473 | 482 | 479 | 3.4 | 37.50 | – |
| Abruzzo | 41.00 | – | 480 | 476 | 480 | 479 | 4.7 | 39.90 | – |
| Molise | 40.50 | – | 471 | 467 | 469 | 469 | 4.3 | – | – |
| Basilicata | 40.00 | 447 | 447 | 473 | 474 | 471 | 4.6 | 36.65 | – |
| Campania | 40.50 | 439 | 451 | 447 | 446 | 448 | 2.5 | 27.50 | 20.00 |
| Puglia | 40.00 | 441 | 489 | 488 | 490 | 489 | 2.6 | 39.00 | – |
| Sardinia | 40.00 | 438 | 469 | 456 | 474 | 466 | 3.00 | 19.00 | 9.90 |
| Calabria | 39.00 | – | 448 | 442 | 443 | 444 | 3.70 | 32.40 | – |
| Sicily | 37.00 | 427 | 453 | 450 | 451 | 451 | 5.00 | 23.10 | 23.10 |

**Table 2**
Correlation matrix and sample sizes for variables shown in Table 1.

| | PISA 06 | PISA 09 | PISA 09 | PISA 09 | PISA 09 | Blond Hair | XR1a | E1b1b |
|---|---|---|---|---|---|---|---|---|
| | Avg | Rdg | Math | Sci | Avg | % | | |
| Latitude | .97* | .89** | .90** | .91** | .91** | .81** | .85** | −.84* |
| N | 12 | 20 | 20 | 20 | 20 | 20 | 13 | 5 |
| PISA 2006 Average | — | .90** | .92** | .93** | .93** | .88** | .88* | −.77 |
| N | | 12 | 12 | 12 | 12 | 12 | 9 | 4 |
| PISA 2009 Reading | | — | .90** | .96** | .97** | .72** | .81* | −.90* |
| N | | | 20 | 20 | 20 | 20 | 13 | 5 |
| PISA 2009 Math | | | | .98** | .99** | .70** | .88** | −.81* |
| N | | | | 20 | 20 | 20 | 13 | 5 |
| PISA 2009 Science | | | | | .99** | .76** | .84** | −.91* |
| N | | | | | 20 | 20 | 13 | 5 |
| PISA 2009 Average | | | | | | .74** | .86** | −.88* |
| N | | | | | | 20 | 13 | 5 |
| Blond Hair % | | | | | | | .73** | −.41 |
| N | | | | | | | 13 | 5 |
| XR1a | | | | | | | | −.72 |
| N | | | | | | | | 4 |

* and ** denote statistical significance at $p<0.05$ and $p<0.01$, respectively

students. A statistically representative sample was identified, consisting of 3,851 schools, 7,810 classes and 166,199 students for assessment in five school years consisting of Primary 2 (age 7–8), Primary 5 (age 10–11), Middle 1 (age 11–12), Middle 2 (age 12–13), and Senior 2 (age 15–16). For the final year of middle school (corresponding to the state exam at the end of the first scholastic cycle), a sample of 1,312 schools and 28,361 students was drawn from a total of 5,969 schools, 27,646 classes and 586,790 students. Results were presented for five Italian regions consisting of the North West (Aosta Valley, Liguria, Lombardy, Piedmont), the North East (Emilia-Romagna, Friuli-Venezia Giulia, Trentino-Alto Adige/Südtirol, Veneto), the Center (Latium, Marche, Tuscany, Umbria), the South (Abruzzo, Apulia, Basilicata, Calabria, Campania, Molise) and the Islands (Sicily and Sardinia).

The report presents results as percentages of correct answers above or below the national average. It does not give standard deviations, but it gives confidence intervals from which the statistical significance of the differences can be estimated. The results for Italian language ability are given in Table 3. It will be seen that the average percentages of correct answers are generally highest in the northern regions, intermediate in the central region, lower in the south, and lowest in the islands. For 3 of the 5 school years (1st and 2nd year of middle school and 2nd year of secondary school), the confidence intervals of the northern (North East + North West) and the southern (South) regions do not overlap, showing that the differences are statistically significant ($p<0.05$). The northern students performed better than the southern students in the first 2 years the (2nd and 5th years of primary school) but the differences are not statistically significant. The islands (Sicily and Sardinia) obtained the lowest percentage of correct answers. The differences between the islands and northern Italy are statistically significant in all the 5 school years. The average performance of central Italy is lower than that of northern Italy but this difference is significant only for the last year (2nd year of secondary school).

The results for math ability are given in Table 4 and show similar regional differences to those for the Italian language. The average percentages of correct answers are highest in the North (NW + NE), lower in the Central, still lower in the South and lowest in the Islands. The differences between northern (NW + NE) and southern Italy are statistically significant for all the 5 school years except the first (2nd primary). The differences between northern Italy and the islands are statistically significant for the four older classes. Central Italy scores significantly lower than northern Italy in the last 2 years of school and significantly higher than in southern Italy and the islands for 3 of the 5 years (1st middle, 3rd middle and 2nd secondary). It may be argued, however, that statistical significance inferred from interval confidences derived from such large samples should be treated with caution.

It will be noted that the regional differences in both language and math ability increase with age. For example, in language ability the regional differences in the youngest children (P2) range between 1.6 and −3.8, a difference of 5.4, while the differences in the oldest children (2S) range between 3.6 and −4.4, a difference of 8.0. Similarly, in math ability the regional differences in the youngest children (P2) range between 0.8 and −1.0, a difference of 1.8, while the differences in the

**Table 3**
Regional differences in Italy in language ability.

| Region | P2 | P5 | M1 | M2 | S2 |
|---|---|---|---|---|---|
| North West | 1.6 | 0.5 | 2.2 | 4.1 | 3.6 |
| North East | 1.0 | 0.2 | 1.6 | 5.2 | 3.1 |
| Central | 1.6 | 1.0 | 1.8 | 2.0 | −1.0 |
| South | −1.4 | −0.2 | −1.6 | −4.9 | −1.2 |
| Islands | −3.8 | −2.0 | −4.8 | −5.0 | −4.4 |

**Table 4**
Regional differences in Italy in math ability.

| Region | P2 | P5 | M1 | M2 | 2S |
|---|---|---|---|---|---|
| North West | 0.3 | 1.2 | 3.2 | 4.0 | 3.5 |
| North East | −0.2 | 1.4 | 4.2 | 4.4 | 4.3 |
| Central | 0.8 | 0.8 | 1.4 | 2.2 | −1.2 |
| South | 0.4 | −0.8 | −3.2 | −4.8 | −1.8 |
| Islands | −1.0 | −3.0 | −6.0 | −6.0 | −5.4 |

oldest children (2S) range between 4.3 and −5.4, a difference of 9.7. These age differences would be predicted from the thesis that the regional differences have a genetic basis, because the heritability of intelligence increases during childhood (Plomin, DeFries, & McClearn, 1980, p. 334).

## 5. North–south Italian genetic differences

Here we present new data corroborating the theory that the proportions of North African genes in the Italian regions are higher in the south than in the north, while the proportions of central and northern genes in the Italian regions are higher in the north than in the south. These data consist first of the percentages of the populations with blond hair, a marker for northern European ancestry (Coon, 1962) and given by Biasutti (1967). These data are given in column 10 of Table 1 and the correlations between these and the other variables are given in Table 2.

The second source of data on the proportion of central and northern genes in the Italian regions consists of the frequency of the haplogroup xR1 allele. The haplogroup xR1a1 is a marker for European Mesolithic populations, which were characterised by high frequencies of this haplogroup, considered as representative of the original inhabitants of Europe (Capelli et al. (2007). Its frequencies are higher in Central and Western Europe and lower in southern Europe (Semino et al. (2000).

Further data for the proportion of North African ancestry in the Italian regions are available in the frequency of the haplogroup E1b1b allele. This is a marker for North African ancestry, where it reaches frequencies above 50% and peaks at around 82% in Tunisia (Zalloua et al., 2008). The frequencies of the haplogroup xR1 and the E1b1b alleles are taken from Capelli et al. (2006), Capelli et al. (2007), Di Giacomo et al. (2003), Balaresque et al. (2010), Scozzari et al. (2001), and Semino et al. (2000). These data are given in columns 11 and 12 of Table 1 and the correlations between these and the other variables are given in Table 2.

## 6. Conclusions

The data reported in this paper provide further evidence confirming the thesis that there is a north–south gradient for IQ in Italy and that this is associated with the frequencies of genetic markers for the percentages of European and North African ancestry in the populations. The thesis that average IQs are higher in the northern than in the southern regions is now supported by seven sets of data. There are (1) the studies by Peluffo (1962, 1964, 1967) using Piagetian tests; (2) the results of several studies using the Progressive Matrices reported in Lynn (2010b); (3) the reading comprehension, mathematics and science performance of 15 year olds in the 2006 PISA study for 12 regions, for which the average scores are correlated with latitude at .97; (4) the reading comprehension, mathematics and science performance of 15 year olds in the 2009 PISA study for 20 regions, for which the average scores are correlated with latitude at .93; (5) the MT-Advanced results for math and reading abilities reported by Cornoldi et al. (2010); (6) the INVALSI results for math and reading abilities reported by Cornoldi et al. (2010); (7) the newer extensive INVALSI results for math and reading abilities reported in this paper.

The data given in Lynn (2010a) for the north–south gradient of the frequencies of the percentages of European ancestry and North African ancestry in the populations, such that in northern regions the frequencies of genetic markers for the percentages of European ancestry are higher, while frequencies of genetic markers for the percentages of North African ancestry are lower, are corroboratated by three further data sets. These are, first, the high correlation between latidude and the percentage of blonds (.81) as a marker for the percentage of northern European ancestry and showing greater percentages of blonds in the north of Italy. Second, the high correlation between latitude and the frequency of the xR1a allele (.85) as another marker for the percentage of European ancestry in the populations. Third, the high negative correlation between latidude and the frequency of the haplogroup E1b1b allele (−.84) as a marker for the percentage of North African and Middle Eastern ancestry.

Finally, there are high correlations between the two markers for the percentages of central and northern European ancestry in the regional populations (the percentage of blonds and the frequency of the xR1a allele) and IQs measured by PISA 2006 and PISA 2009. For the percentage of blonds the correlations are .876 and.730. For the frequency of the xR1a allele the correlations are .843 and .855. Conversely, there are negative correlations between regional IQs and the frequency of the haplogroup E1b1b allele, a marker the North African and Middle Eastern ancestry. For PISA 2006 and PISA 2009, these correlations are −.773 and −.876. These high correlations provide further support the thesis that the percentage of central and northern European ancestry in the populations across the Italian regions is a significant determinant of the IQs.

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