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Differences in educational attainment, socio-economic variables and geographical location across 79 provinces of the Russian Federation

Andrei Grigoriev [a,*], Dmitri Ushakov [a], Ekaterina Valueva [a], Maria Zirenko [b], Richard Lynn [c]

[a] Institute of Psychology, Russian Academy of Sciences, Moscow, Russia
[b] Faculty of Psychology, Lomonosov Moscow State University, Moscow, Russia
[c] University of Ulster, Coleraine BS52 1SA, Northern Ireland, United Kingdom

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ABSTRACT

Data are reported for educational attainments as a measure of intelligence, a number of socio-economic variables, and latitude and longitude for 79 provinces of the Russian Federation. The average intelligence of the provinces was significantly positively correlated with urbanization ($r = 0.43$), the percentage of ethnic Russians ($r = 0.39$), net migration ($r = 0.54$) and latitude ($r = 0.35$), such that intelligence was higher in the north, and significantly negatively correlated with infant mortality ($r = -0.43$), fertility ($r = -0.39$) and longitude ($r = -0.36$), such that intelligence was higher in the west.

1. Introduction

There have been a number of studies of regional differences in intelligence within countries and their association with a range of socio-economic, demographic and epidemiological phenomena. The most commonly reported of these have been positive associations with per capita income, educational attainment, life expectancy and stature, and negative associations with infant mortality and fertility. These associations have been reported for the regions of the British Isles (Lynn, 1979), France (Lynn, 1980), the United States (McDaniel, 2006; Shatz, 2009), Italy (Lynn, 2010; Piffer & Lynn, 2014), Portugal (Almeida, Lemos, & Lynn, 2011), Spain (Lynn, 2012), China (Lynn & Cheng, 2013), Japan (Kura, 2013), Finland (Dutton & Lynn, 2014), India (Lynn & Yadav, 2015) Turkey (Lynn, Sakar, & Cheng, 2015) and European Russia in the late nineteenth century (Grigoriev, Lapteva, & Lynn, in press).

In the study of European Russia in the late nineteenth century (Grigoriev et al., in press), differences in intelligence, inferred from the differences in literacy rates, were reported for 50 provinces and shown to be significantly negatively associated with infant mortality ($r = -.28$), fertility ($r = -0.75$) and longitude ($r = -0.43$) showing that IQs were higher in the more westerly provinces, and significantly positively associated with stature ($r = 0.56$) and latitude ($r = 0.33$) showing that IQs were higher in the more northerly provinces. In the present paper we extend the study of regional differences in intelligence and their relation to a number of socio-economic variables and geographical location to the whole of the contemporary Russian Federation. It should be noted that the provinces of European Russia in the late nineteenth century were not the same as those in the present day. The late nineteenth century provinces of the three Baltic states of Estland, Livland and Kourland (as they were, corresponding approximately but not precisely to contemporary Estonia and Latvia) and the western and southern provinces now in Lithuania, Belarus and Ukraine are not part of the present day Russian Federation.

2. Method

The average scores obtained in the Unified State Examin 2014 by persons, accepted to state universities and institutions for tertiary education in the year 2014 were analysed for 79 provinces and regions of the Russian Federation and adopted as proxies for average levels of intelligence. There are 83 provinces in the Russian Federation. There are no data for four of these because they have no universities or institutions for tertiary education. The data are given and analysed for 77 of the provinces and for Moscow and St. Petersburg consisting of the cities and surrounding provinces. We combined data for these cities with data for the surrounding provinces and treated them as single regions to make possible comparability with data of other provinces.

The Unified State Exam is the examination for obtaining a high school diploma and for entry to universities and institutions for tertiary education in Russia. This is a central identical objective exam. It consists

* Corresponding author.
E-mail address: andrey4002775@yandex.ru (A. Grigoriev).

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Table 1
EQs, socio-economic variables and latitude and longitude for 79 provinces of the Russian Federation.

Province	EQ	Crim	Fert	IM	Urb	Migr	Lat	Long	% Rus	Inc
Adygeya	83	919	12.9	7.9	47.0	49	45.5	39.5	61.5	17,025
Altay	101	1752	13.7	10.1	55.5	−26	52.5	83.0	92.3	13,629
Amur	89	2185	14.3	13.8	67.1	−53	53.0	128.0	93.4	21,469
Archangelsk	103	1903	12.8	7.1	76.6	−85	64.0	44.0	93.6	23,636
Astrakhan	94	2045	15.1	9.3	66.7	−36	47.0	47.0	61.2	17,773
Bashkortostan	99	1610	14.6	7.9	61.1	−22	54.0	56.5	35.1	21,259
Belgorod	100	968	11.6	7.1	66.6	56	50.5	37.5	91.7	21,563
Bryansk	92	1488	11.4	8.9	69.3	−37	53.5	33.5	94.7	17,422
Buryatiya	80	2419	17.5	8.3	59.0	−47	53.0	109.0	64.9	17,119
Chechnia	77	298	26.2	21.9	34.8	−35	43.0	46.0	1.9	15,257
Chelyabinsk	98	2026	14.4	8.6	82.2	13	54.0	60.5	81.4	19,763
Chuvashiya	101	1328	14.0	5.3	59.8	−36	55.5	47.0	25.8	13,755
Dagestan	84	464	19.1	15.2	45.1	−82	43.0	47.0	3.6	20,648
Ingushetiya	100	410	21.4	12.2	39.9	92	43.0	45.0	0.8	12,375
Irkutsk	93	2481	15.9	9.6	79.5	−30	57.5	106.0	88.3	17,720
Ivanovo	97	1517	11.1	6.1	81.1	10	57.0	41.5	90.6	15,930
Jewish autonomous province	87	2184	14.1	15.5	67.9	−89	48.5	132.5	90.7	18,151
Kabardin-Balkariya	82	1024	16.0	8.7	54.1	−72	43.5	43.5	22.5	13,681
Kaliningrad	103	1582	12.4	5.6	77.5	92	54.5	21.5	82.0	19,371
Kalmykiya	92	1311	15.0	7.7	44.7	−138	46.5	45.5	29.6	10,184
Kaluga	101	1468	11.7	10.2	75.9	14	54.5	35.5	86.0	20,621
Kamchatka	86	1663	13.1	11.3	77.1	−2	57.0	160.0	78.4	31,482
Karachay-Cherkessiya	86	777	13.7	10.6	42.9	−99	44.0	41.5	31.4	13,354
Karelia	101	1799	12.6	7.6	78.8	−15	63.5	33.0	78.9	20,037
Kemerovo	99	2386	13.8	8.8	85.5	−17	55.0	77.5	91.8	18,386
Khabarovsk	94	1977	13.8	11.5	81.5	−4	55.0	137.0	88.0	25,649
Khakassiya	98	2073	16.0	12.9	67.7	−10	53.5	90.0	80.3	15,991
Khanty-Mansi	94	1743	17.7	4.5	91.8	32	62.0	71.0	63.6	36,088
Kirov	102	1604	12.8	7.1	74.8	−39	59.0	47.5	89.4	16,530
Komi	98	1986	14.0	5.9	77.3	−122	64.0	54.0	61.7	26,787
Kostroma	96	1265	12.9	7.8	70.5	−11	58.5	44.0	93.2	15,808
Krasnodar	105	1243	13.0	6.6	53.5	87	45.5	39.5	86.5	21,077
Krasnoyarsk	98	2061	14.5	9.7	76.6	13	65.0	96.0	88.1	22,138
Kurgan	91	2251	13.9	8.7	60.7	−97	55.5	65.0	90.4	16,019
Kursk	101	1347	12.0	7.4	66.5	26	51.5	36.5	92.0	18,808
Lipetsk	93	1158	11.7	8.4	64.0	5	52.5	39.0	92.5	19,777
Magadan	88	2108	12.6	8.4	95.8	−137	62.5	153.0	81.5	36,576
Mari El	94	1373	14.2	8.3	64.3	−36	56.5	48.0	45.1	12,538
Mordviniya	99	950	10.0	8.0	61.3	−38	54.5	44.5	53.2	13,063
Moscow/province	110	1531	11.5	7.8	92.4	123	55.5	37.5	86.7	41,613
Murmansk	99	1834	11.8	6.6	92.7	−101	86.0	36.0	80.7	28,604
Nizhny Novgorod	104	1676	11.8	8.8	79.1	21	56.5	44.5	93.9	21,518
North Ossetiya	85	886	15.3	11.6	63.9	−87	43.0	44.5	20.6	16,185
Novgorod	97	2018	12.1	8.2	70.5	−4	58.5	32.0	88.4	19,649
Novosibirsk	106	1902	13.9	8.4	77.9	80	55.0	80.0	88.7	20,637
Omsk	98	1538	14.9	8.0	71.8	−16	56.0	74.0	83.3	19,469
Orenburg	100	1417	14.8	9.7	59.7	−44	52.0	56.0	74.7	16,539
Oryol	93	1699	11.2	10.5	65.8	−18	52.5	36.5	93.9	16,762
Penza	95	1001	10.8	7.2	67.7	−16	53.0	44.5	84.1	15,765
Perm	105	2441	14.8	8.5	75.1	7	59.0	56.0	83.2	23,270
Primorsk	96	2466	12.6	10.4	76.6	−6	45.5	134.5	85.7	21,300
Pskov	103	1567	11.1	10.0	70.3	4	57.0	29.5	91.5	16,412
Rostov	98	1232	11.7	9.1	67.7	9	47.5	41.0	88.7	17,987
Ryazan	102	832	10.9	9.8	71.0	22	54.5	40.5	89.0	17,664
Sakhalin	87	2067	12.7	6.5	80.8	−31	50.0	143.0	82.3	33,459
Samara	101	1884	12.1	7.0	80.3	16	53.5	50.5	82.3	24,683
Saratov	99	1146	11.4	7.0	74.8	7	51.5	46.0	85.3	14,243
Smolensk	102	1737	10.5	9.6	72.5	8	55.0	33.0	90.7	18,250
St. Petersburg city and Leningrad province	111	1146	11.7	4.9	91.0	152	60.0	32.0	81.8	25,246
Stavropol	97	1276	12.6	11.1	57.6	8	45.0	43.0	80.1	16,877
Sverdlovsk	106	1659	14.3	7.4	84.1	16	58.0	62.0	85.7	27,709
Tambov	95	1087	9.7	4.1	59.1	2	52.5	41.5	94.5	17,470
Tatarstan	104	1353	14.5	6.4	75.9	26	55.5	51.0	39.6	24,010
Tomsk	108	2182	13.6	8.7	71.2	45	58.5	82.0	88.1	17,876
Tula	99	901	10.1	6.6	78.8	−2	54.0	37.5	94.1	19,291
Tuva	97	1911	26.7	18.1	53.9	−119	51.5	94.0	16.1	11,933
Tver	97	1905	11.6	9.5	74.9	6	57.0	35.0	86.6	17,247
Tyumen	92	1892	17.2	6.4	78.9	59	68.0	71.0	69.3	33,281
Udmurtiya	99	1803	15.3	8,5	65,0	−27	57.0	52.5	60.0	16,411
Ulyanovsk	97	1280	11.5	6,9	74,0	−33	53.5	48.0	69.7	16,351
Vladimir	98	1525	11.5	7,8	77,6	−20	56.0	40.5	89.3	16,136
Volgograd	96	1512	11.7	11,1	76,3	−27	49.5	44.5	88.5	16,066
Vologda	93	1990	14.0	8,4	71,3	−9	60.0	41.5	92.5	18,125
Voronezh	100	1188	10.9	6,6	66,3	43	51.0	40.0	91.0	18,885
Yakutiya Sakha	96	1269	17.8	9,6	64,9	−87	65.5	130.0	36.9	28,457
Yaroslavl	99	1359	11.9	8,1	81,9	44	58.0	39.0	92.1	18,513
Zabaykalskaya	87	2851	16.2	7,4	66,8	−69	53.0	116.0	88.3	17,336

EQ – Province EQ 2014; Crim – Criminality 2012; Fert – Fertility 2012; IM – Infant Mortality; Urb – Urbanization 2012; Migr – Migration 2012; Lat – Latitude; Long – Longitude; % Rus – Percentage of Russians in a province; Inc. – Income 2012.

of two subjects – Russian language and math – which are obligatory and some facultative subjects depending on the subject the applicant intends to study. The scores on each subject range from 0 to 100. Each University sets a pass score for entry based on the sum of the scores on the three exams. Thus, the Russian examination for entry to tertiary educational institutions resembles the American SAT in its use of tests of language and math and our use of it as a measure of the intelligence of the Russian provinces in the present study follows the method used by McDaniel (2006) for the United States in his study using scores on the NAEP in language and math for college entry to calculate American state IQs. In the present study, the means of the scores on the three exams were transformed to standard EQs (Educational quotients), an analog of conventional IQs, with a mean of 100 and sd of 15 using the following procedure. The mean (m) and standard deviation (sd) were calculated for all 4737 Russian universities and institutions for tertiary education. These were equal 63, 70 and 10, 56, resp. Then the raw scores for provinces were transformed to standard scores using the formula: 15*(a raw score − m)/sd + 100.

The average scores obtained in the Unified State Exam in 2014 by persons, accepted to state universities and institutions for tertiary education have been published by National Research University Higher School of Economics (Качество бюджетного приема в государственные вузы РФ по направлениям подготовки - 2014, 2014).

Data were obtained from official Russian statistics for 2012 for the provinces for per capita income in roubles, rates of infant mortality, rates of crime per 100,000, urbanization (percentages of the population living in towns and cities), net migration (calculated as the difference between the number of persons who migrated to a region and the number of persons who migrated from this region during the year per 10,000 people; thus, negative values show a population decline), the percentage of ethnic Russians, and the latitude and longitude of the geographical mid-point of the provinces.

3. Results

Table 1 gives descriptive statistics for the data for the79 provinces consisting of the EQs, rates of infant mortality, rates of crime, urbanization, net migration, and percentage of ethnic Russians, per capita income, latitude and longitude. One may be surprised by low score for Jewish Autonomous Province given very high IQ of Jews (see Lynn, 2011b). This seeming anomaly explains simply: according to 2010 census, the percentage of Jews in Jewish Autonomous Province is only 1%. Table 2 gives the Pearson correlations for the variables. Correlations of 0.22 are statistically significant at $p < 0.05$, and at 0.29 are statistically significant at $p < 0.01$.

4. Discussion

There are seven principal points of interest in the results. First, there is a positive correlation of the EQs of the provinces with urbanization ($r = 0.43$, $p < 0.01$) reflecting the highest EQs in the provinces with the major cities of St. Petersburg (EQ: 111), Moscow (EQ: 110), Tomsk (EQ: 108), Sverdlovsk (EQ: 106) and Novosibersk (EQ: 106). This result confirms that obtained in the late nineteenth century in which St Petersburg and Moscow had the highest IQs, apart from the three Baltic states that are not part of the contemporary Russian Federation, reported by Grigoriev et al. (in press). The high EQ of Moscow is consistent with several studies reporting that the populations of capital cities have higher IQs than the rest of the population, e.g. in the British Isles and France (Lynn, 1979, 1980) and in Portugal (Almeida et al., 2011). One likely explanation for this is that a higher than average intelligence may be needed to migrate from the provinces to take advantage of the greater opportunities available in capital cities. We believe that the more general association of intelligence with urbanization across regions has not been reported previously for countries but is consistent with a number of studies reporting that intelligence is generally higher in towns and cities than in rural areas (e.g. Stoddard, 1943).

Second, the negative correlation of intelligence with infant mortality ($r = -0.43$, $p < 0.01$) confirms the negative negative correlation ($r = -0.28$) for European Russia in the late nineteenth century reported by Grigoriev et al. (in press) and is consistent with the negative correlations across the regions of the British Isles ($r = -0.78$), France ($r = -0.30$), Italy ($r = -0.80$), the American states ($r = -0.54$), Finland ($r = -0.79$) and India ($r = -0.39$) (Dutton & Lynn, 2014; Lynn, 1979, 1980, 2010; Lynn & Yadav, 2015; Reeve & Basalik, 2011). At the individual level an association between infant mortality and the low IQ of mothers has been reported by Savage (1946). It is proposed that the explanation for these correlations is that populations with high intelligence are more competent in looking after their babies, e.g. by avoiding accidents, and are able to give them better nutrition, which makes them healthier and more resistant to disease.

Third, the negative correlation of intelligence with rates of fertility ($r = -0.39$, $p < 0.01$) confirms the negative correlation ($r = -0.28$) for European Russia in the late nineteenth century reported by Grigoriev et al. (in press) and indicates that fertility has been dysgenic in Russia for the last century. These results are consistent with the negative correlations of intelligence with rates of fertility across the American states ($r = -0.37$) (Shatz, 2009), the regions of Turkey ($r = -0.89$) (Lynn et al., 2015) and the regions of India ($r = -0.25$) (Lynn & Yadav, 2015) and with studies in many countries showing dysgenic fertility during the twentieth and twenty-first centuries (Lynn, 2011a; Woodley & Figueredo, 2013).

Fourth, there is no association between intelligence and rates of crime ($r = 0.06$). However, rates of crime are positively associated with urbanization ($r = 0.48$, $p < 0.01$) confirming the results for the regions of the British Isles (Lynn, 1979) and a number of studies reporting that crime rates are generally higher in towns and cities than in rural areas (e.g. Wilson & Herrnstein, 1985).

Fifth, the positive correlation of intelligence with migration ($r = 0.57$, $p < 0.01$) shows that there was net migration from provinces with lower intelligence into those with higher intelligence. This result is consistent with a number of studies in other countries reporting this including the British Isles (Lynn, 1979), France (Lynn, 1980) and more recently across 12 regions of Turkey ($r = 0.66$, $p < 0.01$) (Lynn et al., 2015). The principal explanation of this result appears to be that provinces with higher intelligence are more attractive places in which to work and live, and hence people in provinces with lower intelligence tend to migrate to them.

Sixth, there is a positive correlation of EQs with the percentage of ethnic Russians ($r = 0.39$, $p < 0.01$) confirming a number of other studies (Grigoriev & Lynn, 2009, 2014; Shibaev & Lynn, 2015).

Seventh, the low correlation ($r = 0.13$) between regional intelligence and per capita income is inconsistent with studies in a number of countries which have found significant positive correlations. We believe this is principally explained by incomes in the Russian provinces being largely determined by the extraction of oil and gas and these occupations are not strongly cognitively demanding.

Eighth, turning now to the geographical correlates of the EQs of the provinces, there is a positive correlation of the EQs of the provinces with latitude at 0.35 ($p < 0.01$) showing that intelligence tend to be higher in the north than in the south. The correlation is almost the same as that of 0.33 ($p < 0.05$) in the late nineteenth century reported by Grigoriev et al. (in press). In the contemporary data, latitude is positively correlated with the percentage of ethnic Russians at the same magnitude of 0.35 ($p < 0.01$) suggesting that the positive association of the EQs of the provinces with latitude is attributable to the greater proportions of ethnic Russians in the more northern provinces. The correlation of EQs of the provinces with longitude is negative at −0.36 ($p < 0.01$) showing that intelligence tend to be higher in the west than in the east. The correlation of longitude of the provinces with the proportions of ethnic Russians is negligible at 0.04 showing that the lower EQs in the east

Table 2
Correlations for EQs, socio-economic variables and latitude and longitude for 79 provinces of the Russian Federation.

	EQ	Crim	Fert	IM	Urb	Migr	Lat	Long	% Rus
Crim	0.06								
Fert	−0.39	−0.02							
IM	−0.43	−0.10	0.62						
Urb	0.43	0.48	−0.45	−0.46					
Migr	0.54	−0.17	−0.26	−0.30	0.24				
Lat	0.35	0.40	−0.19	−0.40	0.66	−0.03			
Long	−0.36	0.53	0.28	0.27	0.16	−0.30	0.07		
% Rus	0.39	0.46	−0.70	−0.38	0.61	0.31	0.35	0.04	
Inc	0.13	0.26	−0.08	−0.26	0.64	0.20	0.47	0.36	0.21

EQ – Province EQ 2014; Crim – Criminality 2012; Fert – Fertility 2012; IM – Infant Mortality; Urb – Urbanization 2012; Migr – Migration 2012; Lat – Latitude; Long – Longitude; % Rus – Percentage of Russians in a province; Inc. – Income 2012.

are not attributable to lower proportions of ethnic Russians. Possible explanations for the lower EQs in the east may be that ethnic Russians have lower average intelligence on account of significant numbers having an admixture with aboriginal populations and being the descendants of criminals deported to Siberia. It may be predicted from the negative correlation of migration with longitude (−0.30) that the negative correlation between intelligence and longitude will grow in future.

An interesting issue is one of the correlation of the IQ estimates for contemporary and 19th century Russian provinces. Because of great differences between contemporary and 19th century administrative-territorial divisions, this issue demands a special treatment. This will be done in further studies.

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Further reading

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