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Dysgenic Fertility in the Russian Federation

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Data are reported for intelligence and fertility in the Russian Federation. There was a statistically significant negative correlation for 29 provinces showing dysgenic fertility for intelligence in contemporary Russia. The negative relationship between test score and number of children was observed at the individual level as well. This relationship is not linear: only third and higher order births are associated with lower intelligence. Dysgenic fertility for intelligence was greater for men than for women, mainly because Raven scores of childless women were slightly lower than those of women with one or two children.

Introduction

There are a number of studies showing that there has been a negative correlation between intelligence and fertility in Europe and the United States since the closing decades of the nineteenth century and therefore that fertility has been dysgenic (Lynn, 2011; Meisenberg, 2010b; Nyborg, 2015; Woodley & Figueredo, 2013). This negative correlation has also been reported for regions of countries, i.e. regions with lower average intelligence have greater fertility. This has been shown for the American states (r = -.37) (Shatz, 2009), the regions of Turkey (r = -.89) (Lynn, Sakar & Cheng, 2015), the regions of India (r = -.25) (Lynn & Yadav, 2015), for European Russia in the late nineteenth century (r = -.28) (Grigoriev, Lapteva & Lynn, 2016) and for 79 provinces of the Russian Federation using educational attainments as a measure of intelligence (r = -.39) (Grigoriev, Ushakov et al., 2016). Even in the mid-19th century, the relationship between fertility and education was already negative at the level of Prussian counties (Becker, Cinirella & Woessmann, 2010). Thus the relationship appears to be universal today and has, in Europe, existed since at least the 19th century. We report here contemporary data for Russia on this association.

Method

Intelligence was assessed by the Standard Progressive Matrices (SPM) (Raven, Raven & Court, 2000) for a sample aged 17-50 years in 29 provinces of the Russian Federation. The SPM was administered with a time limit of 20 minutes. We have shown the 20-minute timed version of SPM has a high correlation with the untimed SPM (r = .70 p<.001) (Davydov & Chmykhova, 2016). The skewness of Raven scores for the total sample (aged 17-65) is -.723. Floor effects and ceiling effects were not observed, perhaps because of the time-limited administration of the test. Participants also answered a Life Data Questionnaire to provide some personal information. SPM and Life Data Questionnaire were administered individually or in small groups of up to 20 people. Testing and interviews were carried out at home (53.5 percent) and at office, school or university (46.5 percent) in the presence of the tester. The data were collected in 2005-2006.

The purpose of the study was to estimate the intelligence of various groups of the Russian population and to determine its correlates. This research was organized by the Department of Research and Innovation of the Modern University for the Humanities (MUH). Locally research was carried out by the MUH branches in Russian provinces.

Academic and administrative staff of MUH and senior students enrolled at 'Psychology' were involved as testers. In total, 465 testers in 47 regional branches of the Modern University for the Humanities were involved. Participants were selected using multistage stratified territorial cluster sampling. MUH branches had a quota for a sample in accordance with the distribution of the Russian population by province, type of settlement, gender and age. The participants were recruited by testers from the available groups (local firms or schools, etc.). The sample for estimation of average intelligence in the provinces consisted of 4,645 participants aged 17-50 (44.0 percent males, mean age 31.3) from 101 settlements. This age group was used to avoid fluctuations in SPM scores due to age and gender (Davydov & Chmykhova, 2016). Sample sizes ranged from 28 to 365 participants (mean 154.8) for different provinces. The data for Moscow were drawn from the city and the province.

Information about the average number of children per person was obtained from 1362 respondents in our sample aged 40-50 (43.6 percent males, mean age

44.7) who answered this question in the Life Data Questionnaire administered in conjunction with the SPM.

Data for the Russian provinces on birth rates (average number of live births per thousand of the population in a year) and total fertility rates (TFR — average number of children that would be born to a woman over her lifetime at current age-specific fertility rates) were obtained from official Russian statistics for 2012 (Russian Federal State Statistics Service, 2016).

Results

Differences between provinces

Table 1 gives SPM average scores and the birth rates and total fertility rates (TFR) for the 29 provinces. The Pearson correlation of SPM scores with total fertility rate (TFR) is -.49, and with birth rate is -.57. Both correlations are statistically significant at $p<.01$.

Table 1. *Standard Progressive Matrices and fertility for Russian regions.*

Provinces	SPM	Birth rates	TFR	Provinces	SPM	Birth rates	TFR
Altay	44.62	13.7	1.811	Orenburg	44.91	14.8	1.953
Bashkortostan	45.68	14.6	1.859	Oryol	43.81	11.2	1.536
Belgorod	45.89	11.6	1.515	Perm	41.26	14.8	1.907
Chelyabinsk	41.74	14.4	1.809	Pskov	42.31	11.1	1.656
Kaliningrad	39.22	12.4	1.625	Samara	42.91	12.1	1.539
Kalmykiya	40.64	15.0	1.889	Saratov	44.28	11.4	1.507
Kamchatka	44.98	13.1	1.725	Smolensk	48.56	10.5	1.430
Karachay-Cherkessiya	38.75	13.7	1.628	Sverdlovsk	37.71	14.3	1.827
Karelia	44.26	12.6	1.708	Tambov	45.25	9.7	1.416
Khakassiya	31.18	16.0	2.001	Tatarstan	43.37	14.5	1.796
Kostroma	42.64	12.9	1.828	Vladimir	43.79	11.5	1.619
Krasnoyarsk	41.04	14.5	1.755	Volgograd	45.81	11.7	1.536
Moscow	42.26	11.5	1.408	Vologda	41.12	14.0	1.840
North Ossetiya	38.14	15.3	1.956	Voronezh	41.53	10.9	1.449
Novosibirsk	41.27	13.9	1.711				

Differences between individuals

We examined the relation between number of children and intelligence among those aged between 40 and 50 years (N=1362) whose fertility can be considered to be largely complete (Lynn, 2004). The results are given for men and women in Table 2. This shows that for both men and women intelligence decreases significantly when the number of children is more than 2 (ANOVA

F=4.29, p<.01 with post hoc Games-Howell test). Remarkably, for males the decline of Raven scores with increasing number of children is linear while women with 1 or 2 children score higher on average than both the childless and those with more than 2 children.

Table 2. *Standard Progressive Matrices and number of children for those aged 40-50.*

	N Children	N	Mean ± St. Dev.
Men	0	95	43.71 ± 8.81
	1	171	41.51 ± 10.09
	2	277	40.75 ± 10.02
	3	40	38.97 ± 9.77
	4+	11	35.00 ± 10.02
Women	0	103	40.46 ± 9.96
	1	213	41.39 ± 10.04
	2	383	41.63 ± 10.30
	3	51	37.49 ± 10.11
	4+	18	36.89 ± 9.82

Calculation of the selection differential

The consequences of differential reproduction for the next generation can be calculated from the results presented in Table 2. First, the selection differential SD is calculated as the average Raven score of the children assuming that children have the same scores as their parents:

$$SD = \frac{1}{N}\sum_{i=1}^{n}(RAV_i - \overline{RAV})\frac{CH_i}{\overline{CH}}$$

In this equation, N is the sample size, RAVi is the Raven score of the individual, $\overline{RAV}$ is the average Raven score of the sample, CH_i is the actual number of children, and $\overline{CH}$ is the average number of children. Assuming 4.5 children as the average of the 4+ category, the selection differential is calculated as -0.878 Raven score points in males and -0.271 points in females. The standard deviation of the total sample is 9.799, so that one Raven score point is the equivalent of 1.53 IQ points. Therefore the selection differentials translate into -1.343 IQ points for males and -0.415 IQ points for females, averaging to 0.879 IQ points.

In reality, children do not have the same average score as their parents because not all variation depends on additive genes. To estimate the genetic response to selection (RS), and with it the predicted score average of the next generation (assuming no change in environmental and non-additive genetic effects), the selection differential SD has to be discounted by the additive heritability h^2 of the trait:

$$RS = SD \times h^2$$

This is known as the breeder's equation. The value of h^2 in the Russian population is not known. In the West, additive heritability of measures of general intelligence, including Raven scores, is near 0.5 (Haworth et al., 2010; Plomin & Deary, 2015). This is confirmed by studies of regression to the mean in children of parents with known IQ, which typically find IQs of children half-way between parents' IQ and average population IQ (Plomin & DeFries, 1980; Vogler & DeFries, 1983). Assuming a value of 0.5 for h^2, the response to selection is -0.44 IQ points (males and females combined). In other words, everything else being equal, genetic selection is predicted to decrease the average IQ in Russia by 0.44 points per generation. This is a lower-bound estimate because it does not take account of measurement error, the magnitude of which is not known with certainty for the timed version of the SPM.

Discussion

There are four points of interest in the results. First, the significant negative correlation of -.57 between intelligence and birthrate for the provinces and of -.49 for intelligence and TFR for the provinces shows the presence of dysgenic fertility at the level of provinces in contemporary Russia. This result is consistent with the results in other countries summarized in the introduction and also with the finding of dysgenic fertility using educational attainment as a measure of intelligence in European Russia in the late nineteenth century (Grigoriev, Lapteva & Lynn, 2016) and for 79 provinces of the Russian Federation (Grigoriev, Ushakov et al., 2016).

Second, the data in Table 2 show that the relationship between the number of children and intelligence is not linear. There is virtually no association between intelligence and fertility among those with 1 to 2 children. Only those with 3 or more children have significantly lower intelligence. Third, studies in the United States (Meisenberg, 2010a) and Taiwan (Chen at al., 2013) reported that the fertility-lowering effect of intelligence is greater in females than in males, but the data in Table 2 show that this was not found in the present study. The results are atypical in that for males there was a linear negative relationship between Raven scores and number of children, whereas in females, those with 1 or 2 children scored slightly higher than the childless. In consequence, dysgenic fertility was about three times stronger in males than in females. The reasons for this anomaly are unknown. We may speculate that many of the more intelligent Russian women (but not men) want one or two children, and that more intelligent women are more likely than the less intelligent to achieve this aim. Possibly, highly intelligent Western women are more likely than equally intelligent Russian women to prefer a child-free lifestyle.

Fourth, the predicted decline of "genotypic" intelligence in Russia is approximately 0.44 IQ points per generation. We do not have genetic data for our Russian sample, but recent studies in the United States have shown that dysgenic fertility for intelligence and education is associated with selection against "educational attainment genes" as predicted. Specifically, polygenic scores computed from several education-associated genetic polymorphisms were shown to predict fertility outcomes (Beauchamp, 2016; Conley et al., 2016; Woodley of Menie, Schwartz & Beaver, 2016), with the implication that the trait-increasing alleles are becoming less common across generations.

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