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Why Do Finns, Estonians and Finno-Ugric Peoples in Russia Have Such High Intelligence?

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Cultures vary according to many partly genetic factors, including the average intelligence of their people. Studies have indicated that Finns have particularly high intelligence by European standards. However, the causes are unclear. It may be an ancient adaptation to a harsh yet stable ecology or a reflection of more recent demographic factors. We test the hypothesis of ancient adaptation by exploring average IQ and related proxies, in the Finns and among genetically related peoples: Estonians, and Russia's Finno-Ugric speaking minorities. Employing national and regional level data, we find evidence indicating elevated intelligence among Finno-Ugrics, consistent with relatively high Finnish IQ being more than simply a recent phenomenon. We examine anomalies raised by these tentative findings, such as relatively low per capita science Nobel Prize achievement among Finns and our finding of a negative association between suicide rate and Finno-Ugric percentage in a population.
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There is a growing body of evidence that 'cultural differences' can, to some extent, be explained in terms of average differences in partly-genetic psychological traits such as personality and intelligence (Lynn & Vanhanen, 2012;

Wilson, 1975, 1998). 'Intelligence' is widely accepted by psychologists to mean the ability to solve cognitive problems, as measured by IQ tests, which themselves strongly correlate with other measures of cognitive ability such as educational attainment as well as with cultural differences such as criminality, religiosity, trust and conservatism (Lynn & Vanhanen, 2012). Accordingly, understanding the intelligence of Finno-Ugric peoples is potentially very important to understanding their culture.

Dutton et al. (2014) have estimated, based on international student assessment tests and reaction time data, that Finns have the highest IQ in Europe, at somewhere around 105, placing Finland on a par with Northeast Asian countries such as Japan. More recently, Roivainen (2019) has used the WAIS-IV and PISA to suggest that Finnish IQ may be slightly higher than that of other Europeans. Finland ranked third among Western countries in PISA 2018 (OECD, 2019). This test of representative samples of 15-year-olds mostly from OECD countries strongly correlates with national IQ (Lynn & Vanhanen, 2012). Finland was behind Estonia and Canada, the latter having a large immigrant Chinese population with an average IQ estimated at 105 (Lynn & Vanhanen, 2012).

Dutton et al. (2014) suggest that this relatively high Finnish IQ could be a product of the Finns' relatively high levels of Northeast Asian admixture by European standards of between 5 and 10% (Cavalli-Sforza et al., 1994, p. 273), as well as due to the selection pressures of harsher yet more predictable environmental conditions tending to select for higher IQ to solve the more complex problems which such ecologies present, as well as for better impulse control and planning (Lynn & Vanhanen, 2012). However, the authors note that, alternatively, their findings may be due to Finland's relatively late industrialization. This may have caused the documented negative association between intelligence and fertility — which has been shown to have genetic consequences (Kong et al., 2017) — to commence later in Finland than in other European countries (Dutton & Woodley of Menie, 2018); or else, it may be due to a famine and subsequent pestilence which wiped out 30% of the Finnish population around the year 1698. It may be that those who were wealthier — with wealth being a robust correlate of intelligence (see Jensen, 1998) — were better able to survive this. This could have acted as a selection event because heritability of intelligence is high at around 0.8 in modern societies**.** This qualifier is necessary because we only know heritability in modern societies well enough. We don't know what IQ heritability was in preindustrial times (or in backward countries today), without the educational horserace that we have now (Lynn, 2011, p. 101; Panizzon et al., 2014).

Congruous with these interpretations, Dutton et al. (2016) have reported, based on the PISA student assessment tests and other data, that Finland's 6%

Swedish-speaking minority has lower average IQ than the Finnish majority, despite being substantially over-represented among Finland's socioeconomic elite. Finland-Swedes, they demonstrate, are a cline between Finns and Swedes, though the (poorer) Finns may also have been subject to harsher selection, with historical famines disproportionately impacting the monolingual interior of Finland. The selection hypothesis is supported by other experts, who see genetic factors as one of the main causes of why Finland scored highly in IQ tests and school assessment studies, though the high quality and quantity of Finnish education is seen as germane, even if in part reflecting the nature of the people who can produce such an education system (e.g., Rindermann et al., 2016).

These studies raise an important question. Is Finland's relatively high intelligence ancient in origin, perhaps a product of Northeast Asian admixture and adaptation to extreme environmental harshness? Or is it recent, possibly reflecting its late industrialization? If the answer is the former, then we would expect ethnic groups which have a relatively close genetic affinity with the Finns to display evidence of elevated levels of average intelligence, in comparison to other ethnic groups living in comparable environments today. We will test this by examining genetic data from Finland, Estonia, and from the Finno-Ugric speaking peoples of Russia. As already noted, the Estonians came first in PISA 2018, which would imply high national intelligence. We will explore demographic variables associated with intelligence, the extent to which they are found in these populations in the expected direction, and how any anomalies might be interpreted. It should be emphasized that the available data are merely national level correlates of intelligence. However, these are all that is available, so we have to employ them. Accordingly, although results cannot conclusively prove our case one way or the other, they are likely to provide a useful indication of what is likely to be the most plausible hypothesis.

Which Finno-Ugric groups are closely related to the Finns?

However, before we begin this analysis we must be clear on which groups we are assessing and why. Finno-Ugric peoples are defined by speaking languages from the Finno-Ugric language group. However, there are differences in the extent to which these Finno-Ugric peoples are genetically related to the Finns and to test our hypothesis we must only assess those ethnic groups that are genetically close to the Finns. Much information is available about male ancestry through the study of the male-inherited Y chromosome. There are four Y-chromosomal haplogroups in Europe (Quiles, 2017). R1a, R1b and I are predominant in Western (R1b), Eastern (R1a) and Northern (I) Europe, but haplogroup HG-N is the predominant Y-chromosomal haplogroup in Europe's north-eastern segment. This group, which is strongly (but not absolutely) associated with the migrations of Finno-Ugric peoples, originated in East Asia. There it split off from the Macro-HG-NO more than 21-25,000 years ago. The primary part of the HG-N branch moved westward to Siberia 12-14,000 years ago, and finally arrived in Europe 5-10,000 years ago (Ilumäe et al., 2016). Subclades of HG-N1a1 (N1c1 in earlier research) are associated with the migrations of Siberian hunter-gatherer groups into Northeastern Europe c. 3800 and 2500 BC.

HG-N is associated with the Finno-Ugric languages and was found to be one of the Y-chromosomal haplogroups whose frequencies were positively correlated with intelligence at the cross-national level ($r = .27$ to .29, $\beta = .32$ to .48). Both its origin from higher latitudes and the close connection to the East Asian haplogroup O were used as an explanation for this association (Becker & Rindermann, 2016, Appendix II). The subclades of HG-N are carried by around one third of the Estonian population and two thirds of the Finnish population (Quiles, 2017, p. 38-39). Across Russia, HG-N can be detected in lesser and varying frequencies but is present in specific Finno-Ugrian ethnicities such as the Komi.

Although Hungarians speak a Finno-Ugric language, their frequency of HG-N (M231) is only 0.47% (Völgyi et al., 2009). In contrast, 45.60% of Hungarians carried a version of HG-R and 29.77% a version of HG-I. This means that Hungarians are far closer to Indo-European speaking Europeans than to the Finns and related East Baltic peoples. Genetic distances, estimated as Fst using 11 Y-STR (short tandem repeat) and 49 Y-SNP (single nucleotide polymorphism) markers, to Sami people were 0.1149, to Finland 0.24011, to Estonia 0.11976, and to Mari 0.13983. By contrast, the genetic distance between Hungary and Germany is only 0.03606, and a quasi-zero-distance was estimated to Bulgaria with -0.00193. Thus the male ancestors who brought their Finno-Ugrian language to Hungary were almost entirely replaced.

With 47.20%, HG-N frequency is also high in Sami people. The various Sami languages are Finno-Ugrian. However, Tambets et al. (2004) consider a western origin for the maternal ancestry of the Sami more likely than an Asian origin based on mitochondrial (mt) haplogroup frequencies. Predominant mt-HGs in the Sami are HG-V with 41.6% and HG-U5b1b1c with 47.6%. Both HGs are prevalent in 12-13% of the Finnish and Karelian populations, in around 11.0% of Mari, 5.0-6.0% of the Mordwins and even less in Estonians and Komi. Y-HG N3 is prevalent from 37.1% in Swedish Sami up to 55.1% in Finnish Sami, but a recent Siberian flow of Y chromosomes into the Sami gene pool is considered to be unlikely because of the absence of HG-N2 and Q in Sami populations.[1]

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[1] For a detailed discussion of these assorted Finno-Ugrian peoples, see Tikhomirov (2020).

Based on the above analysis, we decided to assess the Finns, Estonians, and the Finno-Ugrian peoples of Russia, but to exclude the Sami and the Hungarians. This is because the Finns, Estonians and the various Finno-Ugric groups of Russia turned out to be a cluster of relatively closely related populations originating from early migratory movements which are significantly different from the rest of Europe. In particular, the frequencies of the Y-chromosomal HG-N are taken as an indicator for the strength of this special prehistory reflected in today's Finno-Ugrian populations.

Data

We gathered IQ scores or proxies for these in all of the polities under examination, drawing on already available data. We also gathered data on ethnic dynamics and genetics in the Finno-Ugrian polities as well as on potential confounds which might be relevant to understanding the reasons for and origins of IQ differences. We present these in the following sections. The final dataset is also presented in the appendix (Table A1).

The level of analysis is a mixture of national and regional units based on the available data. Estonia was taken as a single case due to its small population of around 1.3 million. Finland was subdivided into four areas: Etelä-Suomi (South) with Pääkaupunkiseutu (Capital Area: Espoo, Helsinki, Kauniainen, Vantaa), Länsi-Suomi (West), Itä-Suomi (East), and Pohjois-Suomi (North). We averaged data from Pääkaupunkiseutu and Etelä-Suomi because some data for Finland's South does not distinguish between the two units. For Russia, we focused on oblasts and autonomous regions.

Ethnic shares

The share of Finno-Ugric people in Estonia was equated with the share of ethnic Estonians and Finns within Estonia. According to data from CIA (2018) from 2011 it was 68.70% for ethnic Estonians and 0.60% for ethnic Finns, in sum 69.30%. Data from Statistics Estonia (2018, RV0222) revealed a similar share of 69.14%. We used 2015 instead of 2017 data to achieve greater time agreement with the sample tested in PISA-2015 (see below). Ethnic Russians made up 25% of Estonia's population. Mixtures between both ethnic groups are possible, so we estimated a rounded-up share of Finno-Ugric people in Estonia's population of 70%.

Finland is an ethnically very homogenous country with a share of ethnic Finns on the total population in 2019 of 87.3. The biggest minority are Swedes with 5.2% (Statistics Finland, 2020). There are no data given for shares of non-Finns in the four observed areas, but Statistics Finland (2018b) reported immigrant shares for 2019 in Helsinki (15.97%), Espoo (17.05%), Vantaa (19.28%), Turku (11.76%), Tampere (7.75), Oulu (4.28%), Lahti (7.16%), Jyväskylä (5.19%), Vaasa (9.24%) and Lappeenranta (7.68%). These shares were aggregated to 13.43% for Etelä-Suomi with Pääkaupunkiseutu, 8.49% for Länsi-Suomi, 4.28% for Pohjois-Suomi and 0.00% for Itä-Suomi, and used as proxies of non-Finns.

According to the Russian Federal Statistics Service, the share of Finno-Ugrian speakers in the total population of the Russian Federation is 1.62%. This is very small in comparison to the other two countries. However, it is sufficient for there to exist Finno-Ugrian autonomous regions within the Russian Federation, which are marked out by the recognized status given to their Finno-Ugric minorities. These are the Republics of Komi, Karelia, Mari El, Udmurtia and Mordovia. There are, in addition, further Russian autonomous districts which include Finno-Ugrian minorities, such as the Yamalo-Nenets autonomous district, but the percentage of Finno-Ugrians is too small for these regions to be regarded as Finno-Ugric.

Intelligence

School performance and IQ are highly correlated, and a high loading of international school assessment test results on the cross-national *g* has been confirmed (e.g. Lynn & Meisenberg, 2010). We searched for results from school assessment tests at the national and sub-national level which would provide a representative estimate of the IQ of the respective populations.

First, we explored results from the Programme for International Student Assessment (PISA) 2014/15 available at the national and some sub-national levels (Jouni, 2016). Rindermann (2007) reported correlations of .84 between PISA 2003 and national IQ and a general factor loading of .99 on the cross-national *g.* Lynn and Becker (2019) confirmed these strong correlations with .76 between IQ and the average score of 76 countries on PISA results between 2000 and 2015. National results for Estonia, Finland and Russia were taken directly from the official report (OECD, 2016). Total scores were calculated as means from the three PISA-scales Science, Reading and Math. For Estonia, PISA-tot. is $M_{(534.19;519.14;519.53)} = 524.29$, for Finland PISA-tot. is $M_{(530.66;526.42;511.08)} = 522.72$, and for Russia PISA-tot. is $M_{(486.63;494.63;494.06)} = 491.77$. Vettenranta et al. (2016) reported regional PISA data from 2015 for the five or four Finnish areas named above separately. Data were given for all three PISA scales and averaged. For Pääkaupunkiseutu PISA-tot. is $M_{(554;551;534)} = 546.33$ and for Etelä-Suomi PISA-tot. is $M_{(532;526;512)} = 523.33$. Both were averaged to 534.83. The population ratio of these two units was close to 50:50. Therefore we always formed the unweighted arithmetic mean. For Länsi-Suomi PISA-tot. is $M_{(517;516;500)} = 511.00$, for Itä-Suomi

PISA-tot. is $M_{(522;520;502)} = 514.67$, and for Pohjois-Suomi PISA-tot. is $M_{(533;526;512)} = 523.67$.

To achieve better comparability with other scales, which we will explore below, we transformed PISA-scores into Greenwich-IQ scores. This was achieved by equating the mean PISA-total score of the UK to an IQ of 100 and the PISA-total score *SD* of UK to 15. The mean PISA total score of the UK, calculated from the PISA scales Science, Reading and Math, is $M_{(509.22;497.97;492.48)} = 499.89$. The PISA-total score *SD* was calculated by pooling *SD*s from the three PISA-scales: $SD_{(99.56;96.69;92.56)} = 96.34$ (OECD, 2016). This gave us the results shown in Table 1.

Table 1. *National and regional IQ scores based on PISA 2015.*

Country / region	British percentile	Greenwich IQ
Russia	46.6	98.7
Estonia	60.0	103.8
Finland	59.4	103.6
Capital + South	64.2	105.4
Western Finland	54.6	101.7
Eastern Finland	56.1	102.3
Northern Finland	59.8	103.7

For Russian municipalities, final scores from the Russian United State Exam (USE) were available as IQs. Russia scored 2.5 points lower than Britain in cross-national intelligence scores, therefore this difference has to be deducted from the given USE final scores to convert them into Greenwich IQs (Lynn & Vanhanen, 2012).

Additionally, we used literacy scores from 1897 given by Grigoriev, Lapteva and Lynn (2016), based on the Russian Imperial census and representing the share of people able to read in any language. School assessment studies like PISA reflect the current or a more recent state of education, and therefore only represent a snapshot of the observed variable. However, deeper anchored cultural values or genetic factors driving cognitive ability and education are relatively stable over time, should therefore also be able to be detected a century or longer in the past.

Intelligence and ancestry of Russian Finno-Ugrians

We have no data of direct IQ research on Finno-Ugrian speaking ethnicities in Russia. We only have the total score of PISA and USE scores at the level of districts and regions. We do not have separate scores for Finno-Ugrian and Russian speakers within these administrative units. However, we do know the percentages in each region who identify as Finno-Ugrian, as opposed to simply Russian. Consequently, we can look at the relationship between the percentage of Finno-Ugrians in a given region and that region's average USE score. This can be seen in Table 2.

Table 2. *Share of Finno-Ugrians in Russian regions and USE score.*

	% Finno-Ugrian	% Russian	USE score
Komi	23.12	61.7	97
Mari El	42.19	45.1	100
Mordovia	39.95	53.2	97
Udmurtia	27.61	60.0	103
Karelia	9.15	78.9	97
Penza Oblast	3.99	84.1	97
Bashkiria	3.59	35.1	96
Khanty-Mansy AR	3.25	63.6	90
Perm Oblast	4.10	83.2	101
Kirov Oblast	3.36	89.4	102
Ulyanovsk Oblast	3.09	69.7	98

USE final score was taken from Grigoriev et al. (2016). The correlation between % Finno-Ugrians in the region and USE score is not strong, at .25. However, it is positive and marginally stronger than the correlation between % ethnic Russians in a region and the USE, which is 0.22. It must be remembered that there are multiple ethnic groups in Russian regions, a fact which helps to make sense of these numbers. Using PISA data, the relationship between % Finno-Ugrians in a country and average IQ score is even stronger: 0.79.

Finno-Ugrians in Russia are a declining population. Between 2003 and 2015, they declined by 17% due to cultural assimilation, migration, and low birth rate (Myasnikova, 2015). Estonia's population has fallen by 18.7% over the same period for the same reasons. Only Finland's has risen, but this has been due to immigration from developing countries. In 1926, 34% of the Karelian population regarded themselves as Finno-Ugrian. Now it is under 10% as Karelians have increasingly become culturally and genetically absorbed into the northern Russian population as we can see from N3 haplogroup analysis (Balanovskaya & Balanovsky, 2007). For much of the twentieth century, the Finno-Ugrian regions in northern Russia remained pre-industrial. These issues will become germane in our discussion. We now turn to environmental factors which may be relevant to making sense of our findings, insomuch as variation of general intelligence at the individual level has been shown to be at least 20% a function of environment based on meta-analyses of twin studies (Lynn, 2011, p. 101).

Climate

If Cold Winters Theory (Lynn & Vanhanen, 2012) is relevant to the relatively high intelligence of East-Baltic Finno-Ugrians, we would expect to find that their regions of origin were relatively cold. Moreover, world-wide differences in average intelligence have been shown to be negatively associated with national average temperature (Lynn & Vanhanen, 2012). The Estonian Weather Service reported an average temperature in January for the whole of Estonia of about -3.5°C and in July of 17.4°C, calculated from annual data between 1981 and 2010. Regional data for mean temperatures in Finland came from three meteorological stations, located in Helsinki, Jyväskylä and Sodankylä (Statistics Finland, 2018 2018 a or b?). The Helsinki station can be used for Pääkaupunkiseutu + Etelä-Suomi, Jyväskylä is located in central Finland and approximately at the same latitude as Itä- and Länsi-Suomi, and Sodankylä is in the North. To compensate for short-term variations in temperature, the mean °C of all years from 2000 to 2017 were averaged. For Finland's total, we calculated the means from the three stations. For Pääkaupunkiseutu + Etelä-Suomi, mean temperature is -2.8°C in Winter and 16.7°C in Summer, for both Länsi- and Itä-Suomi it is -6.7°C in Winter and 15.2°C in Summer, for Pohjois-Suomi it is -11.4°C in Winter and 13.3°C in Summer, and for all of Finland it is -7°C in Winter and 15.1°C in Summer.

Finno-Ugrian peoples in Russia historically lived under relatively harsh conditions in the Ural region and near the Barents and Kara Seas. The average temperature in January ranges from -9°C in Mordovia (the mildest winter for a Finno-Ugrian region in Russia) to -18°C in Mari El. July temperatures range from 14°C in Komi to 19°C in Mari El.

Life and Death

Suicide rate has been shown to be positively associated with intelligence at the national level (Voracek, 2004), although life expectancy overall is positively associated with intelligence (Lynn & Vanhanen, 2012). There is a stereotype about high "Finnish suicide", but actually there is no strong statistical basis for this idea. For example, in the USA the suicide rate of people with Finno-Ugrian roots is below the national average (Voracek, 2006). Statistics Estonia (2018, Dataset: RV043) reports an infant mortality rate of 3/1000 births for 2015. In the same year, males had a mean life expectancy at birth of 73.08 and females of 81.85 years (Statistics Estonia, 2018, Dataset: RV045). Statistics Finland (2018a) gives for the whole country in 2015 an infant mortality rate of 1.7/1000 births, and a life expectancy at birth for males of 78.53 and for females of 84.13. No regional data are available from this source.

In 2015 there were 195 suicides registered in Estonia (Statistics Estonia, 2018, Dataset: RV56). A total number of 15,243 deaths were reported for the same year (Dataset: RV030), giving a rate of 12.79 suicides per 1000 deaths. Statistics Finland (2018a) reported a total number of deaths by suicide and intentional self-harm for Finland of 731. By using the 5,479,530 Finnish population in 2015, this would result in a ratio of 0.13 suicides per 1000 population. The total number of deaths in Finland in 2015 is reported as 52,302, so 731 suicides would result in a ratio of 13.74 suicides/1000 deaths. Suicide rates in Finland at the regional level are not given, but the numbers of suicide investigations conducted by the police are given. The sum for all of Finland in 2015 is 692 and close to the 731 from the statistics above. Total numbers of deaths were also available for the five AVI regions. 'AVI' is the Finnish acronym for its administrative regions.

The sum of all deaths in 2015 in Finland is 52,207 and 99.82% of the total number of deaths in Finland reported above. So, we used these data to calculate the regional ratio of suicides/1000 deaths: In AVI Southern Finland there were 19,785 total deaths and 290 suicide investigations, which gives a number of suicides/1000 deaths of 14.68. In AVI Southwestern Finland there were 7,268 total deaths and 92 suicide investigations, which gives a number of suicides/1000 deaths of 11.84. In AVI Eastern Finland there were 7,013 total deaths and 83 suicide investigations, which gives us a number of suicides/1000 deaths of 11.84. In AVI Western and Inland Finland there were 12,024 total deaths and 139 suicide investigations, which gives a number of suicides/1000 deaths of 11.56. In AVI Northern Finland there were 4,142 total deaths and 62 suicide investigations, which gives us a number of suicides/1000 deaths of 14.97. In AVI Lapland there were 2002 total deaths and 26 suicide investigations, which gives a number of suicides/1000 deaths of 12.99. From these data, we calculated the suicide rates for the four main regions. For Pääkaupunkiseutu + Etelä-Suomi, the mean of AVI Southern and Southwestern Finland was used ($M_{(14.68\%;12.66\%)} = 13.67\%$), for Länsi-Suomi (West), the mean of AVI Southwestern and Western and Inland Finland was used ($M_{(12.66\%;11.84\%)} = 12.25\%$), Itä-Suomi (East) was equated with AVI Eastern Finland (11.84%), and for Pohjois-Suomi (North) the mean of AVI Northern Finland and AVI Lapland was used ($M_{(14.97\%;12.99\%)} = 13.98\%$). The total percentage for Finland would be 13.25%, very close to the percentage from the calculation above.

The average suicide rate in Russia is 14.2 per 100,000 males, placing Russia 18th in its suicide rate worldwide. Estonia occupies 35th place and Finland 33rd. At the regional level, suicide is also relatively high: in Komi there are 33.1 suicides per 100,000, in Mari El 25.3, in Mordovia 19.8, in Udmurtia 40.1, and in Karelia there are 23.3. Despite the suicide rate in Udmurtia and Komi being double the Russian average, the correlation of suicide rate with % of Finno-Ugrians in a Russian region is -.17.

Unemployment

A stimulating environment at key developmental stages has been shown to be important for the achievement of maximal genotypically possible intelligence (see Dutton & Woodley of Menie, 2018). In addition, it has been argued that parental unemployment is associated with childhood neglect and lack of intellectual stimulation, leading to developmental delay and reduced adult IQ (Perkins, 2016). Unemployment is also an apparent consequence of low IQ (see Jensen, 1998). Statistics Estonia (2018, Dataset: TT442) reports an unemployment rate for the whole country in 2015 of about 6.2% of the total workforce. Finnish unemployment rates are given by Statistics Finland (2018a, Index: Population aged 15-74 by labour force status, sex and major region) for the whole country as 9.4%. For Helsinki-Uusimaa it was 8%, for Southern Finland it was 10%, for Western Finland it was 9.8%, and for Northern and Eastern Finland it was 10.4%. Helsinki-Uusimaa and Southern Finland were averaged to 9%; the other percentages were taken unaltered.

According to Russian Federal Statistics Service the total unemployment rate in Russia was 4.9% at the beginning of 2018. But the unemployment rate in the regions of Russia that we analyzed is a little bit higher: from 5% in Udmurtia to 9.7% in Mari El. In the Komi it is 7.9%, Mordovia – 4.4%, Karelia – 6.7%. So, the average rate of unemployment for these larger Finno-Ugrian pockets inside Russia is 7.03%.

Genetics

Meta-analyses of twin studies have shown that variation of general intelligence among individuals in the population is up to 80% genetic (Lynn, 2011, p. 101). Becker and Rindermann (2016) and Rindermann, Woodley and Stratford (2012) have shown that genetic markers, which represent phylogenetic branches within the human species, can be associated with intelligence in various directions and strengths. Sets of these markers are called haplogroups and can be found on the Y-chromosomal or mitochondrial DNA. The genetic markers associated with people of Finno-Ugric origin or ancestry are Y-haplogroup N and their subclades, which can be found in high frequencies in Northeast Europe and North Asia (Rootsi et al., 2007). The frequency of these markers within a population can therefore be used as a proxy for the proportion of the population that is of ethnic Finno-Ugrian origin and, as an indicator, should be less susceptible to incorrect attributions than, for example, the language that is used by the people today.

Shares of Y-haplogroup N and subclades were taken from Rootsi et al. (2007), Table 3. For Finland, this share is 63%, for Estonians 30.6%, for Northern Russians 28.6%, for Russians in general 16.4%, for Mari El 41.3%, for Mordovia 19.3%, for Komi 35.1%, for Udmurtia 85% and for Khants 76.6%. These shares are for ethnic groups and not for regional populations. Percentages of Finno-Ugrian speakers in the area surveyed by us substantially vary and, in some cases, are very small. We used the following calculation to correct the HG-N frequencies to the regional population. First: The frequency of HG-N in a Finno-Ugric ethnicity was multiplied by the share of this ethnicity in the total regional population. Second: The frequency of HG-N given for Russians in general was multiplied by the share of Russians in the total regional population. Third: Both scores were summed. This resulted in 18.23 for Komi, 24.82 for Mari El, 16.44 for Mordovia, 33.31 for Udmurtia, 12.92 for Khanty-Mansy autonomous region, 25.52 for Estonia, and 59.11 for Finland. Russia (total), 16.4% was used unaltered.

Analyses

Correlation analyses between all used variables were done at the regional level ($N = 5$ to 16) and *r*- and *p*-values are presented. However, the latter should not be evaluated uncritically. It has been argued by Pollet (2013) that *p* values are not suitable for cross-national analyses when the number of included observations matches the number of possible observations. The countries and regions we used in this study cover nearly the total inhabited by Finno-Ugrians across the world and could be increased in number only by further subdivision which, however, would decrease the amount of available data, and it would add little information because of spatial autocorrelation (Getis, 2010).

Depending on the results of the correlation analysis, multivariate regression analyses are planned. We used R-statistics for computing betas and R^2. Because, based on the data set we have created, we can expect a greatly reduced number of cases when cases are pair- or listwise excluded and methods of missing data imputation have proven to be error-prone especially in the case of missing-not-at-random (Lüdtke et al., 2007), we used the full information maximum likelihood method both to impute missing values (R-command: missing = “FIML”) and as model estimators (R-command: estimator = “ML”).

Results

Table 3 lists correlations between all variables in Finno-Ugrian countries and Finno-Ugrian regions of Russia. Cases are eleven regions from Russia, four regions from Finland, and Estonia. A correlation of $r = .44$ ($N = 6$; $p = .383$) was found between % of haplogroup N and % of Finno-Ugrian speakers in the population. This is a positive but not a statistically significant one, therefore both variables measure little of the same. Half of the correlations found for both variables (% FU vs % HG-N) point in the same direction, as IQ ($r = .52$ vs .37; $N = 16$ vs 6; $p = .041$ vs .464), USE ($r = .25$ vs .91; $N = 11$ vs 5; $p = .455$ vs .032), literacy ($r = .90$ vs .16; $N = 7$ vs 5; $p = .005$ vs .796), infant mortality ($r = -.95$ vs -.20; $N = 10$ vs 5; $p < .001$ vs .907). In contrast, different directions were found for suicide ($r = -.80$ vs .41; $N = 10$ vs 5; $p = .005$ vs .498), temperature in January ($r = .59$ vs -.22; $N = 10$ vs 5; $p = .073$ vs .722) and temperature in July ($r = -.27$ vs .42; $N = 10$ vs 5; $p = .458$ vs. .478).

It can therefore be said with relative certainty that regions with a higher proportion of Finno-Ugrians, whether measured by ethnic census or population genetic analysis, tend to have higher IQs, better education and higher life expectancy, but seem to differ in terms of climatic conditions. However, regions with higher temperatures in January tend to have higher IQ ($r = .85$; $N = 10$; $p = .002$), literacy ($r = .85$; $N = 7$; $p = .016$), life expectancy ($r = .74$; $N = 10$; $p = .015$); therefore lower infant mortality ($r = -.55$; $N = 10$; $p = .100$) and suicide rate ($r = -.70$; $N = 10$; $p = .024$). In contrast, regions with higher temperatures in July tend to have lower IQ ($r = -.42$; $N = 10$; $p = .223$) and life expectancy ($r = -.28$; $N = 10$; $p = .427$) with higher infant mortality ($r = .24$; $N = 10$; $p = .496$) and suicide rate ($r = .24$; $N = 10$; $p = .513$). The only irregularity are the USE scores, which are higher in regions with higher temperature in July ($r = .59$; $N = 5$; $p = .292$) but lower in regions with higher temperature in January ($r = -.62$; $N = 5$; $p = .264$).

Table 3. *Correlations among sociodemographic outcomes per region. $N = 5$ to 16 ($M_N = 8.2$); Pearson's r above the diagonal ($p \leq .05$ bold), p values below the diagonal.*

	1	2	3	4	5	6	7	8	9	10	11
1. IQ (PISA)		.52	**.84**	**.52**	.37	**.78**	-.57	.03	**-.66**	**.85**	-.42
2. USE	.101		-.25	.25	**.91**	.05	.05	-.22	.70	-.62	.59
3. Literacy	.019	.685		**.90**	.16	**.97**	**.97**	.19	-.74	**.85**	.04
4. % FU	.041	.455	.006		.44	**.97**	**.97**	.00	**-.80**	.59	-.27
5. % HG-N	.464	.032	.796	.383		.07	.07	-.06	.41	-.22	.42
6. Life exp.	.007	.937	<.001	<.001	.907			-.12	**-.83**	**.74**	-.28
7. Inf. mort.	.084	.531	.026	<.001	.746	<.001	<.001	-.02	**.64**	-.55	.24
8. % unem.	.929	.718	.681	.991	.918	.742	.742		-.03	-.20	-.20
9. Suicide	.039	.187	.056	.005	.498	.003	.003	.926		**-.70**	.24
10. Jan. °C	.002	.264	.016	.073	.722	.015	.015	.579	.024		.16
11. July °C	.223	.292	.935	.458	.478	.427	.427	.577	.513	.652	

Since correlation analysis shows that share of Finno-Ugrians and temperatures are both candidates for influencing IQ and education, we did a multivariate regression analysis with %FU, %HG-N, Jan.°C and July°C as predictors and IQ, USE and Literacy as alternating criteria. The simultaneous use of %FU and %HGN in the same model causes errors due to the many missing values. Therefore, we run the analysis twice, once with %FU and once with %HGN.

Tables 4 and 5 give results from multivariate regression analyses. Shares of variance explained were surprisingly high, between 58% and nearly 100%, but log-likelihood was bad and restricted the meaningfulness of the models. Similar to the correlation analysis, results strongly depend on the variable used to represent share of Finno-Ugrians but also on the criteria used to represent cognitive ability. %FU showed significant effects on literacy (β = .84; *S.E.* = 0.292; $p < .001$), but IQ was better predicted by Jan.°C (β = .45; *S.E.* = 0.186; $p = .015$). In contrast, %HG-N showed significant effects on IQ (β = .87; *S.E.* = 0.065; $p < .001$) and USE (β = .89; *S.E.* = 0.199; $p < .001$) but literacy was better predicted by Jan.°C (β = .82; *S.E.* = 0.164; $p < .001$). July°C mostly shows effects contrary to Jan.°C, especially on IQ in the %FU model (β = -.42; *S.E.* = 0.245; $p = .086$) and in the %HG-N model (β = -.30; *S.E.* = 0.066; $p < .001$).

Table 4. *Effects of the share of Finno-Ugrians in the total populations (%FU) and mean temperature in January and July on three measures of cognitive ability.*[2]

Predictor	IQ (PISA)	USE	Literacy
%FU	.25 (0.239)	.67 (1.049)	.84*** (0.292)
Jan.°C	.45* (0.186)	.15 (0.400)	.16 (0.168)
July °C	-.42 (0.245)	-.10 (0.342)	-.20 (0.195)
N	16	16	16
logL(θ)	-78.262	-76.011	-61.943
R^2	.490	.554	.957

Notes: Standardized regression coefficients (β), standard errors (*S.E.*) in parentheses; *logL*(θ) for H_0; *$p < .05$, **$p < .01$, ***$p < .001$.

[2] As described under *Analyses*, we used FIML to impute missing values and for model estimator. Therefore, estimations of models used all available data, did not exclude any cases and the number of observations is 16.

Table 5. *Effects of frequency of haplogroup N and temperature on three measurements of cognitive ability.*

Predictor	IQ (PISA)	USE	Literacy
%HG-N	.87*** (0.065)	.89*** (0.199)	.28 (0.258)
Jan.°C	.79*** (0.063)	.05 (0.260)	.82*** (0.164)
July°C	-.30*** (0.066)	-.30 (0.172)	.17 (0.255)
N	16	16	16
logL(θ)	-61.844	-61.301	-55.741
R^2	.978	.837	.775

Notes: Standardized regression coefficients (β), standard errors (*S.E.*) in parentheses; *logL*(θ) for H_0; *$p < .05$, **$p < .01$, ***$p < .001$.

Discussion

Limitations

Before going into the main part of the discussion, we have to talk about limitations in the informative value of our findings. First, data for many variables are drawn from more than one source, mostly different between countries, and could thus have been determined according to different standards. Additionally, haplogroup frequencies are mostly estimated from relatively small and therefore possibly less representative samples. That might explain the relatively weak correlation between share of Finno-Ugrians estimated by ethnic registrations and frequencies of Y-haplogroup N.

Second, the small number of geographic areas used restricts the informative value of quantitative methods, especially when the large number of missing values is also taken into account. This is accompanied by the problem of insufficient suitability of the model estimators used, because although these have been described as the most accurate method, they are not absolutely reliable (Lüdtke et al., 2007).

Third, due to the selected aggregated analysis level, a warning must also be given about the ecological fallacy (Monaco, 2013). The transfer of our findings to the individual level can be viewed as highly problematic because we examined regions from several countries together, and the different country conditions can possibly explain the patterns found. Here a new investigation of the same question on an individual level would be desirable for the future. Genome-wide markers could be used with principal components analysis to define the “typical”

Finno-Ugrian genome, and GWAS to calculate polygenic scores for intelligence and personality. The association between both would be very interesting and personalized genome research offers a wealth of data for such a purpose, but its use is made more difficult by personal rights and political taboos.

Finno-Ugrian intelligence

In terms of our hypothesis, it could be observed that high intelligence, as well as most of its key correlates, is not limited to Finland. It is found in all of the countries and regions which we have analyzed: the more Finno-Ugric an area is, the higher is its IQ, educational attainment, literacy in 1897,[3] employment level and so forth. Overall, an east-west gradient occurred with percentages of Finno-Ugric, IQ and literacy higher in the West (Finland, Estonia) and lower in the East (Russian regions). These relationships are not statistically significant in any case but tend to be robust across both levels of analysis and variables used as criteria. Insomuch as this relationship can be found not just in Finland but also with regard to linguistically and genetically related peoples in Estonia and Russia, it would imply that evidence of Finnish high intelligence in Dutton et al. (2014, 2016) cannot simply be explained by late Finnish industrialization (Talve, 1997) or other factors unique to Finland. A more parsimonious explanation would encompass the findings in Estonia and Russia. A reasonable explanation is that the ancestors of these peoples had elevated intelligence, possibly due to adaptation to a particularly harsh yet stable ecology, and this is still reflected in their descendants today. As already noted, it must be stressed that the findings should be interpreted with caution because of the indirect nature of the evidence. They nevertheless suggest that the high intelligence of the Finns is ancient in origin.

Consistent with this explanation is the finding that the Finno-Ugrian populations in Russia's Finno-Ugrian regions have long been in decline due to migration and cultural assimilation with the majority. Studies have shown that migration is positively associated with intelligence. Proposed reasons include that the planning and future-orientation necessary to migrate require intelligence, and that intelligence is associated with being open to new ideas. Also, in industrialized societies, intelligent people born in provincial areas are likely to become professionals who migrate to cities (Jensen, 1998). Similarly, political and cultural conservatism tends to be associated with low IQ. Those who have low IQ tend to

[3] It is possible that the Lutheran stress on literacy might explain why Finland and Estonia were so highly literate. But, on the other hand, it could be argued that the adoption of Lutheranism, with its stress on a coherent theology and thus systematizing, could be a reflection of intelligence (see Meisenberg et al., 2012).

be hostile to new ideas and they also tend to be dogmatic in these conservative views (Jensen, 1998). So, we would expect that the long process of population decline among Russia's Finno-Ugric minorities would be paralleled by a process of decline in their average IQ. Every generation, it would be disproportionately the most intelligent Finno-Ugrians who would make their way to cities such as St. Petersburg, and it would be the most intelligent Finno-Ugrians who would better understand the socioeconomic benefits of adopting the majority culture, thus failing to teach their children their native language and so becoming part of the Russian population. Yet even despite this long process of likely IQ decline among Russia's Finno-Ugrians, the percentage of Finno-Ugrians in Russian regions is positively associated with regional average intelligence.

Higher frequency of the typical Finno-Ugric Y-chromosomal haplogroup N is associated with higher IQ but only conditionally associated with the percentages of Finno-Ugrian speakers. This unexpected pattern would allow an explanation which includes a strong mixture of Russian Finno-Ugrians with non-Finno-Ugrians, which decoupled genetic from ethnic affiliation in the case of Russian Finno-Ugrians. Another explanation for the lack of association is given by Tambets et al. (2018), who report strong genetic ties of Siberian Finno-Ugrians with Finns but not with Estonians. The ancestry of the latter is overall more similar to Latvians than to Finns, Karelians and Mari, in particular, by a stronger admixture of Western hunter-gatherers with simultaneous absence of Siberians. Therefore, Estonians could be seen, similar to Hungarians and Mordwines, as genetic outliers from the Finno-Ugric people. Furthermore, strong variations within the ancestral components between Finno-Ugrians, also those in Russia, were reported. The share of Siberian ancestry varies between 79% for Nenets and 6% for Karelians whereas the share of ancestors from Corded Ware (early Indo-European) culture varies between 55% for Karelians and 16% for Nenets. This implies that the use of Y-chromosomal haplogroups is ignoring finer genetic structure in smaller geographic areas or genetically more similar populations.

More cautiously, a similar process can be hypothesized as having occurred in Finland and Estonia. Until the nineteenth century, Finnish cities were overwhelmingly Swedish-speaking and Finns — likely the more intelligent Finns — who migrated to the cities would generally adopt Swedish. During the twentieth century, there was Finnicization of the Swedish-speakers but the higher status Swedish-speakers tended to maintain their Swedish culture and language, a process which continues to this day with low SES among Finland-Swedes predicting raising your child as Finnish-speaking (see Dutton et al., 2016; Finnäs, 2012). Despite this process, which we would expect to potentially decrease Finnish intelligence, it is higher than that of the Finland-Swedes.

Similarly, in Estonia until the twentieth century the dominant language in the cities was German and it would seem probable that each generation highly intelligent Estonians would have migrated to cities such as Tallinn and adopted German. In 1881, over 5% of Estonians were so-called Baltic Germans and they were a highly significant part of the country's socioeconomic elite, with such status predicted by intelligence (Jensen, 1998). Between this time and World War II almost all of the Baltic Germans left Estonia (Prikulis, 1994). However, despite this process, it would appear that Estonian average IQ remains high by European standards. Accordingly, the model which would bring together all of these findings would be that the Finno-Ugrians, as a whole, are a high-IQ population by European standards and this is at least partly for genetic reasons that lie in the distant past. Considering the temperature and genetic data which we have discussed, adaptation to a cold, stable and therefore intellectually challenging ecology appears to be a plausible explanation. Such an ecology would also have promoted impulse control, a point made by Cochran and Harpending (2009).

Two Anomalies

We have found two anomalies. The most obvious question would be: Why are Finno-Ugric populations so small and why is their intellectual attainment so modest? Dutton et al. (2014) have shown, for example, that despite its high IQ and high levels of education, Finland has won only 3 (now 4) science Nobel Prizes, with 3 out of 4 having been won by Finland-Swedes. Per capita, this is the lowest in Western Europe and on a par with countries that have an average IQ of 90. Estonia has won zero science Nobel Prizes.

An explanation for this anomaly has been proposed by Kura et al. (2015). In attempting to understand Japan's low per capita level of science Nobel Prizes, they highlight the nature of genius. They argue that geniuses tend to be responsible for science Nobel Prizes and intellectual innovation more broadly. Based on a literature review, they conclude that geniuses combine outlier high IQ with moderately low Conscientiousness and Agreeableness, in other words high Psychoticism in Eysenck's classification of personality. This unusual psychological profile means that they can 'think outside the box', yet intelligently, which allows them to have original groundbreaking ideas; and they do not care if their ideas offend vested interests because they are low in empathy, low in altruism, or both. Kura et al., analyzing population gene frequencies associated with social anxiety and social conformity, argue that Northeast Asians are considerably higher than Europeans on these, that these gene forms are negatively associated at the national level with science Nobels and other markers of scientific genius, and that, of their European samples, Finns are the closest to Northeast Asians in terms of these gene frequencies.

Van der Linden et al. (2020) have shown, drawing upon national-level markers for testosterone and other androgens, that among countries that have an IQ of at least 90, average androgen level is positively associated with per capita science Nobel Prizes. They observe that androgens themselves predict low Conscientiousness and low Agreeableness. So, a plausible explanation is that the relatively low intellectual achievement of Finno-Ugrians, as with the Japanese, is that they evolved in an extremely harsh ecology. This selects for higher intelligence but also for strongly cooperative groups and thus very strongly for social anxiety and impulse control. So, it becomes unlikely that the unusual combination of genes which would underpin genius get thrown up, and even when they do the social pressure to conform — to the extent that genius is partly a function of an optimal environment — will be strong (see Dutton & Woodley of Menie, 2018). This would explain why less intelligent countries, like Britain, have higher rates of per capita genius and therefore higher rates of per capita intellectual achievement.

The other anomaly is the suicide rate, as suicide is stereotyped to be high among Finno-Ugric peoples. However, the probable reason for this is that the comparison, in both Russia and Estonia, is mainly with Russians whose suicide rate is even higher, for whatever reason. It is noteworthy that at the regional level the Northeast Asian genetic marker which we already discussed is positively associated with suicide. This might be because Northeast Asians developed tea to purify water, as well as alcohol, whereas Europeans only developed alcohol, leading to a greater genetic tolerance of it among Europeans and it having strongly negative effects on some East Asians (Voracek, 2006). Dutton et al. (2016) have shown that Finland-Swedes score significantly higher than Finns on emotional stability, and it is emotional instability (high neuroticism) which is associated with suicide. Finns were also lower than Finland-Swedes in the General Factor of Personality — interpreted as being socially effective — which might also affect the suicide rate.

Of course, if Finns are adapted to the extreme cold, we might expect them to be high in GFP because social effectiveness would be more important in a harsh and predictable ecology in which tightly structured groups would be selected for. This anomaly may, in part, be caused by genetic drift and founder effect in the small, isolated populations in which many Finns lived between around 500 years ago, when they began to colonize the Finnish interior, and 100 years ago, when they began to industrialize (Peltonen et al., 1999). A parallel explanation is that Dutton et al. (2016) have shown that the Finns' low GFP, in comparison to Finland-Swedes, is driven by their high Neuroticism. Northeast Asians have, contra to predictions about race differences based on Life History Theory (Rushton, 1995), higher Neuroticism than Europeans who, in turn, have higher

Neuroticism than Africans (Eap et al., 2008). Fernandes et al. (2018) have shown that this can be explained by the very high levels of social anxiety among Northeast Asians which, they argue, are adaptive in a harsh yet stable ecology because such people must create highly cooperative groups and plan for the future. This would contribute to understanding the anomaly of lower GFP when comparing Finns and Finland-Swedes.

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Appendix

Table A1. *Data for cross-national/regional analyses.*

Regions	IQ score (PISA 2014/15)	USE score (final)	Literacy % 1987 (both sexes)	% Finno-Ugrians	% Y-haplogroup *N*
Estonia	103.80	n.d.	0.78	70.00	25.52
Russia					
Komi	98.00	97	0.13	23.12	18.23
Mari El	94.00	100	0.16	42.19	24.82
Mordovia	99.00	97	0.13	39.95	16.44
Udmurtia	99.00	103	0.13	27.61	33.31
Karelia	101.00	97	0.19	9.15	n.d.
Penza	95.00	97	n.d.	3.99	n.d.
Bashkiria	99.00	96	n.d.	3.59	n.d.
Khanty-Mansy AR	94.00	90	n.d.	3.25	12.92
Perm	105.00	101	n.d.	4.10	n.d.
Kirov Oblast	102.00	102	n.d.	3.36	n.d.
Ulyanovsk oblast	97.00	98	n.d.	3.09	n.d.
Finland					
Pääkaupunkiseutu + Etelä-Suomi	105.44	n.d.	0.98	86.57	n.d.
Länsi-Suomi	101.73	n.d.	n.d.	91.51	n.d.
Itä-Suomi	102.30	n.d.	n.d.	100.00	n.d.
Pohjois-Suomi	103.70	n.d.	n.d.	95.72	n.d.

Table A2. *Data for cross-national/regional analyses.*

Regions	Life expectancy	Infant mortality	% unemployed	Suicide 2015 (per 100.000)	Average temp. (JAN.)	Average temp. (JULY)
Estonia	77.47	3.0	6.2	12.79	-3.5	17.4
Russia						
Komi	69.46	4.2	7.9	33.10	-12.0	14.0
Mari El	69.94	4.3	9.7	25.30	-18.0	19.0
Mordovia	72.02	5.0	4.4	19.80	-9.0	18.0
Udmurtia	70.44	4.6	5.0	40.10	-14.0	18.0
Karelia	69.18	6.7	9.0	23.30	-11.0	15.0
Penza	73.21	3.2	4.3	22.60	-1.5	19.7
Bashkiria	72.06	5.1	4.7	30.70	-4.4	19.1
Khanty-Mansy AR	n.d.	2.7	2.5	9.10	-10.7	21.0
Perm	70.72	3.7	5.3	33.60	-5.7	19.6
Kirov Oblast	72.47	1.9	4.6	34.00	-5.7	18.6
Ulyanovsk oblast	72.17	5.1	4.0	7.10	-2.7	19.8
Finland						
Pääkaupunkiseutu + Etelä-Suomi	79.40	1.7	9.0	13.67	-2.8	16.7
Länsi-Suomi	80.05	2.1	0.1	12.25	-6.7	15.2
Itä-Suomi	78.40	1.7	10.4	11.84	-6.7	15.2
Pohjois-Suomi	78.65	2.2	10.4	13.98	-11.4	13.3