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Gender Differences in Means and Variability on the Standard Progressive Matrices

for 15-year olds in Ukraine

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Results are reported for gender differences in means and variability on the Standard Progressive Matrices for a sample of 132 15 year olds in Ukraine. There was no statistically significant difference in the mean but girls had lower variability than boys. The mean score was slightly lower than that of the same age group in Britain.

Key Words: Gender differences; Intelligence; Progressive Matrices; Ukraine; Variability.

Not much is known about intelligence in the former Soviet Union. Some studies were carried out in the 1920s and early 1930s and have been summarized by Grigoriev & Lynn (2009). The most well-known of these early studies is that of Luria (1976, 1979) who investigated the intelligence of the Uzbeks in central Asia. Luria did not use intelligence tests but gave a descriptive analysis of the Uzbeks' cognitive abilities. He distinguished two modes of thought designated *graphic recall* (memories of how objects in the individual's personal experience are related) and *categorical relationships* (categorisation by abstract concepts). He found that the thought processes of illiterate Uzbek peasants were confined to *graphic recall* and that they were not able to form abstract concepts or to think in abstract terms. For example, they were also unable to solve syllogisms. Given the syllogism "There are no camels in Germany; the city of B is in Germany; are there camels there?" Luria reported a typical Uzbeks answer as "I don't know, I have never seen German cities. If B is a large city, there should be camels there." Similarly, Luria asked "In the far north, where there is snow, all bears are white; Novaya Zemlya is in the far north; what

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colour are the bears in Novaya Zemlya?”. A typical Uzbek answer was “I’ve never been to the far north and never seen bears” (Luria, 1979, p. 77-8). Thus, Luria concluded that these peoples were not capable of abstract thought: “the processes of abstraction and generalization are not invariant at all stages of socioeconomic and cultural development. Rather, such processes are products of the cultural environment” (Luria, 1979, p. 74). Luria proposed that the ability to think in terms of *categorical relationships* is acquired through education. He did not suggest that the Uzbeks have any genetic cognitive deficiency. Luria’s distinction between the categorization of objects in terms of practical experience and in terms of abstract concepts is similar to Piaget’s (1929) distinction between concrete and formal operations.

These early studies carried out in the years 1926-1931 finding that there were substantial ethnic/racial differences in intelligence in the Soviet Union were not consistent with Marxist orthodoxy which held that these differences would disappear under communism. Accordingly, these studies, particularly that of Luria, attracted a great deal of criticism in the Soviet Union in the early 1930s. This has been described by Kozulin (1984): “Critics accused Luria of insulting the national minorities of Soviet Asia whom he had ostensibly depicted as an inferior race. The results of the expedition were refused publication and the very theme of cultural development was forbidden”. In 1936 intelligence testing was banned in the Soviet Union. It was not until the 1960s and early 1970s that this prohibition was progressively relaxed (Grigorenko & Kornilova, 1997). Luria’s work was not published in Russian until 1974 and English translations were published in 1976 and 1979.

It is only in the last decade that IQs have been reported for three countries of the former Soviet Union, namely Estonia, Lithuania, and Russia. The results of these studies are summarized in Table 1. These IQs are calculated in relation to a British IQ of 100 (standard deviation, 15) and have been collected as part of a research program to collect IQs for all countries in the world. The results are given in Lynn (2006) and Lynn & Vanhanen (2006). The national IQs range from approximately 105 in North East Asia (China, Korea and Japan) through approximately 100

(Britain and western continental Europe, except for the Balkans, where IQs are around 92-94), to approximately 84 in North Africa and the South Asia , and to approximately 70 in sub-Saharan Africa. Placed in this context, the IQs in Estonia, Lithuania, and Russia are only slightly lower than those in western Europe.

Thus, IQs are only available for three of the ten countries of the former Soviet Union. As a further contribution to this question, we present data for intelligence in Ukraine. But at first we consider what prediction can be made regarding the IQ of the Ukrainians. An estimate of the IQ of the Ukrainians, based on the IQ of the neighbouring country (Russia) is given in Lynn & Vanhanen (2006). The estimate is 97. Now we would like to make prediction about the IQ of the Ukrainians based on other predictors.

Firstly, we can use for this purpose the data on anthropological similarity of the Ukrainians to other peoples. These data were collected by V.D. Dyachenko (Дяченко, 1961). Samples from different national populations were measured for a large number of morphological features and eyes, hair and skin color. From his data, the distances between samples can be calculated. The results show that the samples which are close to the Ukrainians and are drawn from populations for which we have the IQ data are Hungarians, Slovaks, and one of two Russian samples. But for the Hungarians, there is a strong suspicion that the ancestors of the Hungarians from Zakarpattia, measured in the study, were Ukrainians, but later they were assimilated. Likewise, the Russian sample is from the region adjacent to Ukraine, where the probability of Ukrainian admixture is high. So among the nations studied by Dyachenko for which we have the IQ data the Slovaks are the most anthropologically close to the Ukrainians. Given the fact that Slovak and Ukrainian languages are both Slavonic and that Slovaks are neighbors of the Ukrainians, it seems reasonable to predict that the IQ of the Ukrainians will be closely similar to that in Slovakia. The IQ of Slovaks is 96 (Lynn & Vanhanen, 2006). So the prediction of the IQ of the Ukrainians based on their anthropological similarity to other nations is 96.

Secondly, we can predict national IQs based on measures of human conditions. One of such measures is the adult literacy rate. Although, as noted by Lynn & Vanhanen (2006, p. 111) “it is possible that, ultimately, the adult literacy rate will rise to near 100 percent in all societies”, it is a useful predictor of national IQs, especially when and where education is not obligatory, as in Russia in the 19th century. There is enough data of the adult literacy rate for Russia in the 19th century, which can be used for comparative analysis of the intelligence of peoples in Russia that time, including the Ukrainians.

Such are the data on literacy (more precisely on illiteracy) of recruits in Russia, called up for military service averaged for the period from 1874 to 1883. These data are given in Table 2.

It can be seen that there was great variability in the adult male literacy rate in Russia in the second half of the 19th century. The rate ranged from about 95 percent in Estlyand and Livland provinces (modern Estonia and part of Latvia) to about 6.5 percent in Ufa province, inhabited mainly by the Bashkir. The rate of the Ukrainians is close to that of agricultural Russian provinces (e.g. Voronezh and Tambov), although lower than the rate for industrial provinces (Yaroslavl etc.).

Another source of evidence, this time not for men solely but for women as well, are data on literacy for different ethnic groups collected about 1880s (the exact data is not given) in regions with mixed population. These are given in Table 3.

It can be seen that the literacy rate of the Ukrainians is again close to the rate of the Russians. Thus, the reasonable prediction of the IQ of the Ukrainians from their adult literacy rate relative to Russians’ in the 19th century is 96-97, as modern Russians have, or a bit lower, given higher rates of literacy in some Russian provinces.

Table 1. IQs in three countries of the former Soviet Union

Country	N	Age	Test	IQ	Reference
Estonia	12–18	2,689	SPM	100	Lynn et al., 2002
Estonia	7–11	1,835	SPM	98	Lynn et al., 2003
Lithuania	8–12	259	CPM	90	Lynn & Kazlauskaitė, 2002
Lithuania	6–16	381	WISC-3	92	Georgas et al., 2003
Lithuania	8–12	1067	CPM	96	Gintilienė & Butkienė, 2005
Russia	14–15	432	SPM	97	Lynn, 2001
Russia	27–55	745	CF	96	Grigorenko & Sternberg, 2001

Table 2. Mean percent of illiterate recruits (males) called up for military service in different provinces for the period from 1874 to 1883 (* - Ukrainian region). Adapted from Encyclopedic Dictionary by Brockhaus & Efron (*Энциклопедический словарь Ф.А. Брокгауза и И.А. Ефрона*, 1893, vol. 18, p. 548).

Province	% of illiterates	Province	% of illiterates
Estlyand	4.85	Saratov	81.12
Livland	5.25	Chernigov*	81.17
Yaroslavl	36.58	Simbirsk	81.72
Courland	39.66	Yekaterinoslav*	82.24
Sankt-Peterburg	40.89	Irkutsk	82.58
Daghestan	42.50	Vitebsk	82.81
Akmolinsk	45.76	Kursk	82.93
Moscow	47.36	Vyatka	83.43
Ter	55.34	Perm	83.54
Vladimir	57.66	Lomzhinsk	83.75
Tver	58.52	Petrokovsk	83.88
Kostroma	63.07	Sedletz	83.98

(Table 2 Continued)

Province	% of illiterates	Province	% of illiterates
Semipalatinsk	63.73	Vilna	84.15
Arkhangelsk	65.16	Voronezh	84.19
Kaluga	67.18	Tambov	84.20
Tula	67.30	Mogilyov	85.87
Novgorod	67.31	Kharkov*	85.95
Ryazan	69.55	Kiev*	86.10
Vologda	70.81	Samarskaya	86.14
Kuban	72.05	Kel'tse	86.15
Olonets	72.12	Kalish	86.18
Yakutia	74.02	Suvalki	86.37
Smolensk	76.02	Kazan	86.71
Warsaw	76.17	Poltava*	87.05
Kherson*	76.24	Orenburg	87.24
Tavriya*	76.42	Stavropol	87.27
Nizhni Novgorod	76.61	Yenisey	87.45
Astrakhan	77.33	Penza	87.55

(Table 2 Continued)

Province	% of illiterates	Province	% of illiterates
Grodno	77.38	Volhynia*	87.56
Oryol	78.75	Tobolsk	88.34
Donskogo Voyska	79.79	Podolsk*	88.64
Pskov	80.42	Tyumen	89.10
Zabaykalie	80.56	Lublin	89.92
Kovno	80.94	Bessarabiya	92.47
Minsk	81.03	Radom Governorate	92.96
Plotsk Governorate	81.06	Ufa	93.59

Table 3. Percent of literacy for different people (mainly peasants) in regions with mixed populations. Adapted from *Encyclopedic Dictionary by Brockhaus & Efron (Энциклопедический словарь Ф.А. Брокгауза и И.А. Ефрона)*, 1893, vol. 18, p. 540).

	Germans	Jews	Ukrainians	Russians	Tartar	Mordvins	Udmurt	Chuvash	Mari
Males	64.7-66.6	48.7	19.1	11.7-15.1	5.3-15.7	3.3-7.3	2-3,6	1.5-5.4	1.4
Females	60.1-67.3	7.6	1.2	1.1-1.6	0.2-0.4	0-0.1	0-0.1	0.1	0

Both estimations (based on anthropological similarities and on the adult rate of literacy) point to virtually the same value. On this basis, we propose the IQ of 96 as the best prediction of the IQ of the Ukrainians. It is already possible to make an estimate of the Ukrainian IQ from the TIMSS (Third International Mathematics and Science Study) study of grade 8 school students aged approximately 14 years carried out in 2007. This study gives average scores in mathematics and science for a large number of countries including Ukraine. These scores have been converted to EQs (educational quotients) by Lynn & Meisenberg (2010) and these are highly correlated at 0.92 with national IQs. These EQs can therefore be used as alternative measures of IQs. From this study the Ukrainian IQ is calculated as 93.0. The TIMSS results are available at:

<http://nces.ed.gov/timss/tables07.asp>

and are given by Martin, Mullis & Foy (2008), and Mullis, Martin & Foy (2008).

We now report an investigation of intelligence in Ukraine.

Method and Results

The test used in this study was the Standard Progressive Matrices (SPM). This is a test of non-verbal reasoning ability and is widely accepted as one of the best tests of intelligence and Spearman's general factor (g) (Jensen, 1998). The test has been used in many countries throughout the world and the results have been reviewed in Lynn (2006). The SPM was administered in 2008 to a sample of 132 school students (68 males and 64 females) with an average age of 15.25 years at socially representative schools in Kiev and Belaya Tserkov, a town of about 200,000 people about 80 km (50 miles) south of Kiev. The school leaving age in Ukraine is usually at 17 years, and virtually all 15 and 16 years are in schools, so the sample can be considered in representative of the population. The males obtained a mean score of 43.1 (sd=8.0) and the females a mean score of 45.1 (sd=6.9).

Discussion

There are three points of interest in the results. First, although the males obtained a lower mean than the females,

this difference is not statistically significant ($p=0.14$). This is consistent with the meta-analysis carried out by Lynn & Irwing (2004) which found no difference between males and females from the age of 6 years up to and including 15 year olds, although from the age of 16 years and older males obtain slightly higher scores.

Second, the mean score of the sample (44.1) is at the 36.5th percentile of the British 1979 standardization sample given by Raven (1981), and this is equivalent to a British IQ of 95. No adjustment need be made to this figure because the British norms on the SPM have not changed over the years 1979-2008 (Lynn, 2009). The IQ of 95 estimated for Ukraine is closely similar to the prediction of 96 given in the introduction, and to the EQ of 93 calculated from the TIMSS study, and also to the IQs of the three other countries of the former Soviet Union given in Table 1. All the studies, except for the first for Estonia, show IQs slightly lower than in Britain. The likely explanation for this is all these countries have lower living standards than those in Britain. Lower living standards reduce the quality of nutrition and health and this has an adverse effect on intelligence. In 2002 the per capita income (measured as Gross national income at purchasing power parity: GNI-PPP) in Ukraine was US\$ 4,800, in Estonia US\$11,630, in Lithuania US\$10,190, and in Russia US\$8,080 compared with US \$26,580 in Britain. These figures, together with those in all other countries of the world, are given in Lynn & Vanhanen (2006).

Third, the males have greater variability of intelligence shown by their larger standard deviation of 8.0, compared with 6.9 for females. The greater variability was noted in the early years of the twentieth century by Ellis (1904), Thorndike (1910) and Terman (1916) and it has been frequently confirmed, e.g. in the United States by Hedges & Nowell (1995), and in Scotland by Deary, Irwing, Der & Bates (2007). Although this phenomenon has frequently been reported, the explanation is not fully understood. Possible factors are that boys are more fragile than girls and more vulnerable to damage from injuries, illness and sub-optimal nutrition that impair intelligence. Another likely factor is that boys are more adversely affected by deleterious

X-linked recessive genes. There is no particular reason to expect that boys are more affected by deleterious autosomal recessive mutations because these have the same expression pattern in males and females. But deleterious X-linked traits, which are mostly recessive (meaning they are not expressed in heterozygous females), have adverse effects mainly in males. This is because females have 2 X-chromosomes, and the effects of a bad mutation on one of them can be compensated for by the good gene on the second X-chromosome. We know at least a dozen forms of X-linked mental retardation (with fragile X as the by far most common form). All we have to postulate is that in addition to these mutations with major effect there are IQ-reducing mutations with small effect on the X-chromosome, with effects that are too subtle to be diagnosed as a mental retardation syndrome. These would produce more boys at the lower end of the intelligence distribution and increase the variability. A third possible factor that could be suggested is that boys are more dependent on feedback about their performance. Being more ambitious than girls (in primates the males have to compete for females), males are more reinforced in their efforts by success, and more easily discouraged by failure. Therefore those who are naturally not very bright tend to be discouraged in further intellectual pursuits by their poor performance while those who notice that they understand well will push extra effort and thereby develop their intelligence even more.

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