A CONFIRMATION OF VALIDITY OF EDUCATIONAL ATTAINMENT AS A MEASURE OF INTELLIGENCE IN DIFFERENT GEOGRAPHICAL AREAS

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Abstract

The validity of regional educational attainments as a measure of intelligence in different regions was estimated using a set of 29 regions from the Russian Federation. Educational attainments were the average scores obtained in the Unified State Exam 2014 by persons who were accepted in state universities and institutions for tertiary education in regions of the Russian Federation in the year 2014. Regional intelligence was assessed using samples aged 17–50 years. The size of the samples was from 28 to 365 participants (mean 154.8). In total 4,645 participants from 101 settlements of Russia were involved. The participants were tested with the Raven's Standard Progressive Matrices, a 20 minute time limitation was applied. Besides, data based on nine additional variables was used. These variables were the rate of crime per 100,000, the rate of fertility (birthrate), the rate of infant mortality, urbanization, net migration, per capita income in roubles (all for the year 2012), the latitude and longitude of the geographical mid-point of the regions, and the percentage of ethnic Russians. While the correlation of educational attainments with the measurements of intelligence in the regions was low (0.10), the functional closeness of these two measures, as estimated by correlating them with additional variables, was high enough (the correlation of the two vectors of correlations was 0.74, $p < 0.05$). This confirms the validity of regional educational attainments as a measure of regional intelligence. The low direct correlation of educational attainments with the measurements of intelligence can be explained by the inaccuracy of both measurements.

Keywords: intelligence, educational attainment, regional IQ.

S. Kanazawa (2006) was the first to attempt to show the relationship between regional IQs and indices of wealth of provinces (in states of the US). His research was based on the study of R. Lynn and T. Vanhanen who

demonstrated such relationships on the country level. Unlike Lynn and Vanhanen, who used direct measurements of IQ in countries[1], Kanazawa used the educational attainment of states as an index of state intelligence. He obtained not high but significant correlations between his index of state intelligence and measures of state wealth.

M.A. McDaniel (2006b) criticized Kanazawa's choice of the measure for educational attainment. He himself used another measure of educational attainment for estimating state IQs in states of the USA and showed the relationship between his estimates and a number of variables (see McDaniel, 2006a). McDaniel's estimates were used in the following studies (Pesta, McDaniel, & Bertsch, 2010; Reeve & Basalik, 2011).

To our knowledge, the use of educational attainments of states of the USA as an estimate of state IQ does not stand up to scrutiny. However, using the educational attainments of Italian provinces as an estimate of province IQ by R. Lynn (2010) conformed to the requirements (Felice & Giugliano, 2011). The reviewers contended that the differences in measures of educational attainment that Lynn had used may have been affected by a number of factors beyond IQ. In contradiction to this critical objection, D.I. Templer (2012) has shown the validity of Lynn's estimates of IQ for Italian provinces: he reported a correlation between Lynn's estimates and direct measurements of the province IQs of 0.91.

Although the use of indices of educational attainment as a measure of regional IQs for the Italian provinces appeared to be justified, this case points to vulnerability of educational attainments as a measure of regional IQ: their validity may be questioned. On the other hand, educational attainments usually have some advantages that psychological measurements often lack: they are usually large scale, sometimes involving whole populations; they proceed at the same time and sometimes regularly. This makes them rather attractive indices of regional IQ. In addition, we have successful precedents of using educational attainment as a measure of regional IQ, which encourages their further use in such a way. Nevertheless, validity of educational attainment as a measure of regional IQ should be controlled, if possible, in each particular case.

Grigoriev et al. (2016) adopted the average scores obtained in the Unified State Exam 2014 by persons who were accepted in state universities and institutions for tertiary education in regions of the Russian Federation in the year 2014 as proxies for average levels of intelligence. The validity of these estimates was confirmed by their correlations with a number of socio-economic variables. In the present paper we further confirm their validity by comparing them with direct measurements of regional IQs.

Method

IQ measurements

Data was collected in 2005–2006.

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[1] Later Lynn & Meisenberg (2010) and Lynn & Vanhanen (2012) used a composite index of intelligence in a country. This index aggregates direct measurements and educational attainment.

Participants

Intelligence was assessed from samples aged 17–50 years in 29 regions of the Russian Federation. The data for Moscow was drawn from the city itself and the Moscow Region. The size of the samples was from 28 to 365 participants (mean 154.8). In total 4,645 participants from 101 settlements of Russia were involved in the present study (44.0 percent of males, mean age 31.3).

Procedure

The participants were tested with the Raven's Standard Progressive Matrices (SPM). The test was administered individually or in small groups (up to 20 persons). A 20 minute time limitation was used. The testing was carried out in the presence of an examiner.

The samples and procedure are described in detail in (Davydov & Chmykhova, 2016).

Educational attainment

Educational attainments for 29 regions were taken from Grigoriev et al. (2016). These are scores obtained in the Unified State Exam 2014 by persons who were accepted in state universities and institutions for tertiary education in regions of the Russian Federation in the year 2014. In Grigoriev et al. (2016), these scores for 79 regions were transformed to standard EQs (Educational Quotients, an analog of conventional IQs), with a mean of 100 and a standard deviation of 15.

Other variables

Data on other variables for 29 regions was taken from Grigoriev et al. (2016). The variables were the rate of crime per 100,000, the rate of fertility (birthrate), the rate of infant mortality, urbanization, net migration, per capita income in roubles (all for the year 2012), the latitude and longitude of the geographical mid-point of the regions, and the percentage of ethnic Russians.

Results and discussion

Data for 29 regions of the Russian Federation on all 11 variables is given in Table 1. Table 2 presents the product-moment correlations for the variables.

The correlation between regional intelligence as measured with SPM and EQ is low (0.10). The most plausible explanation of this is that both measures are not very accurate. EQs characterize only part of school students in the regions, namely persons accepted in state universities and institutions for tertiary education, they do not account for the prestige of universities in a region. On the other hand, samples in the SPM study were sometimes rather small and probably biased. This may reduce the direct correlation between two measures. However, we can use a method of estimating correspondence between these two variables that is more sensitive than correlating them directly.

Such a more sensitive method might be presented by correlating the vectors of correlations of two variables (whose correspondence one would like to estimate),

Average levels of intelligence in regions as measured with SPM, EQs, criminality, fertility, infant mortality, urbanization, net migration, latitude, longitude, percentage of Russians and per capita income for 29 regions from the Russian Federation

Region	SPM	EQ	Crim	Fert	IM	Urb	Migr	Lat	Long	% Rus	Inc
Altai	44.62	101	1,752	13.7	10.1	55.5	−26	52.5	83.0	92.3	13,629
Bashkortostan	45.68	99	1,610	1.6	7.9	61.1	−22	54.0	56.5	35.1	21,259
Belgorod	45.89	100	968	11.6	7.1	66.6	56	50.5	37.5	91.7	21,563
Chelyabinsk	41.74	98	2,026	14.4	8.6	82.2	13	54.0	60.5	81.4	19,763
Kaliningrad	39.22	103	1,582	12.4	5.6	77.5	92	54.5	21.5	82.0	19,371
Kalmykiya	40.64	92	1,311	15.0	7.7	44.7	−138	46.5	45.5	29.6	10,184
Kamchatka	44.98	86	1,663	13.1	11.3	77.1	−2	57.0	160.0	78.4	31,482
Karachay-Cherkessiya	38.75	86	777	13.7	10.6	42.9	−99	44.0	41.5	31.4	13,354
Karelia	44.26	101	1,799	12.6	7.6	78.8	−15	63.5	33.0	78.9	20,037
Khakassiya	31.18	98	2,073	16.0	12.9	67.7	−10	53.5	90.0	80.3	15,991
Kostroma	42.64	96	1,265	12.9	7.8	70.5	−11	58.5	44.0	93.2	15,808
Krasnoyarsk	41.04	98	2,061	14.5	9.7	76.6	13	65.0	96.0	88.1	22,138
The City of Moscow and the Moscow Region	42.26	110	1,531	11.5	7.8	92.4	123	55.5	37.5	86.7	41,613
North Ossetiya	38.14	85	886	15.3	11.6	63.9	−87	43.0	44.5	20.6	16,185
Novosibirsk	41.27	106	1,902	13.9	8.4	77.9	80	55.0	80.0	88.7	20,637
Orenburg	44.91	100	1,417	14.8	9.7	59.7	−44	52.0	56.0	74.7	16,539
Oryol	43.81	93	1,699	11.2	10.5	65.8	−18	52.5	36.5	93.9	16,762
Perm	41.26	105	2,441	14.8	8.5	75.1	7	59.0	56.0	83 2	23,270
Pskov	42.31	103	1,567	11.1	10.0	70.3	4	57.0	29.5	91 5	16,412
Samara	42.91	101	1,884	12.1	7.0	80.3	16	53.5	50.5	82 3	24,683
Saratov	44.28	99	1,146	11.4	7.0	74.8	7	51.5	46.0	85 3	14,243
Smolensk	48.56	102	1,737	10.5	9.6	72.5	8	55.0	33.0	90 7	18,250
Sverdlovsk	37.71	106	1,659	14.3	7.4	84.1	16	58.0	62.0	85 7	27,709
Tambov	45.25	95	1,087	9.7	4.1	59.1	2	52.5	41.5	94 5	17,470
Tatarstan	43.37	104	1,353	14.5	6.4	75.9	26	55.5	51.0	39 6	24,010
Vladimir	43.79	98	1,525	11.5	7.8	77.6	−20	56.0	40.5	89 3	16,136
Volgograd	45.81	96	1,512	11.7	11.1	76.3	−27	49.5	44.5	88 5	16,066
Vologda	41.12	93	1,990	14.0	8.4	71.3	−9	60.0	41.5	92 5	18,125
Voronezh	41.53	100	1,188	10.9	6.6	66.3	43	51.0	40.0	91 0	18,885

Note. SPM – Standard Progressive Matrices; EQ – Regional EQ 2014; Crim – Criminality 2012; Fert – Fertility 2012; IM – Infant Mortality 2012; Urb – Urbanization 2012; Migr – Migration 2012; Lat – Lalitude; Long – Longitude; % Rus – Percentage of Russians in a region; Inc – Income 2012.

Correlations for the variables

	SPM	EQ	Crim	Fert	IM	Urb	Migr	Lat	Long	% Rus
EQ	0.10									
Crim	−0.14	0.40								
Fert	−0.57	−0.16	0.29							
IM	−0.27	−0.41	0.19	0.39						
Urb	0.04	0.56	0.47	−0.17	−0.16					
Migr	0.09	0.71	0.27	−0.36	−0.40	0.73				
Lat	0.10	0.46	0.67	−0.01	−0.17	0.60	0.45			
Long	−0.12	−0.23	0.34	0.41	0.43	0.08	−0.03	0.21		
% Rus	0.23	0.45	0.40	−0.54	−0.14	0.49	0.58	0.53	0.03	
Inc	0.05	0.42	0.25	−0.06	−0.15	0.69	0.65	0.39	0.28	0.17

Note. SPM – Standard Progressive Matrices; EQ – Regional EQ 2014; Crim – Criminality 2012; Fert – Fertility 2012; IM – Infant Mortality 2012; Urb – Urbanization 2012; Migr – Migration 2012; Lat – Lalitude; Long – Longitude; % Rus – Percentage of Russians in a region; Inc – Income 2012.

with some third variables. High correlation between such vectors points to similar structures of relationships of these two variables, and to their functional closeness. This methodology follows the method of correlated vectors developed by A. Jensen to determine the role of the general factor of intelligence (g) in correlations of various mental tests with an external variable (see, for example, Rushton & Jensen, 2005). Namely, we estimated the relationship between the vector of the correlations of measured intelligence with nine variables (see the second column of Table 2) and the vector of the correlations of EQ with the same variables (see the third column of Table 2). The correlation between the two vectors is 0.74 ($p < 0.05$). This points to functional closeness of measures of regional intelligence as measured with SPM and EQ and, hence, confirms their correspondence.

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Подтверждение валидности образовательных достижений как показателя регионального интеллекта

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Резюме

Валидность образовательных достижений регионов как показателя регионального интеллекта была оценена на множестве 29 регионов Российской Федерации. Региональные образовательные достижения представляли собой средние баллы, полученные на Едином государственном экзамене в 2014 г. лицами, принятыми в бюджетные вузы регионов Российской Федерации в 2014 г. Региональный интеллект оценивался на выборках респондентов в возрасте 17–50 лет. Размер выборок варьировал от 28 до 365 (в среднем 154.8). Всего 4645 респондентов из 101 населенного пункта России приняли участие в исследовании. Измерение интеллекта проводилось с помощью теста «Стандартные прогрессивные матрицы Равена» с 20-минутным ограничением времени тестирования. Кроме того, были использованы данные по девяти дополнительным переменным. Этими переменными были число зарегистрированных преступлений на 100 000 человек населения, число родившихся на 1000 человек населения, младенческая смертность, доля городского населения, миграционное сальдо, доход на душу населения в рублях (все за 2012 г.), широта и долгота географического центра региона, доля этнических русских. В то время как корреляция образовательных достижений с измеренным интеллектом была низкой (0.10), функциональная близость этих двух показателей, оцененная путем коррелирования их с дополнительными переменными, была достаточно высокой (корреляция двух векторов корреляций составила 0.74; $p < 0.05$). Это подтверждает валидность образовательных достижений регионов как показателя регионального интеллекта. Низкое значение прямой корреляции образовательных достижений с измеренным интеллектом может быть объяснено неточностью обеих этих мер.

Ключевые слова: интеллект, образовательные достижения, региональный IQ.

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