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**Cognitive health of older migrants:
Russians in Estonia compared with
Russians in Russia and Estonians**

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Abstract

Migrant health studies often indicate that migrants' health is better than that of the native population. However, mixed results exist when studying middle-aged and older population, and when focusing on other health outcomes besides mortality. Cognitive functioning has been proposed as the main indicator of the burden of ageing, while the position of the cognitive health of the foreign-origin population with regard to other population groups is not yet clear. Therefore, we study impairment in verbal learning and fluency of the Russian-origin population in Estonia (n=1373) compared with their sending (n=2339) and host country (n=2365) populations. We use the first waves of the SHARE Estonia (2010-2011) and the WHO SAGE Russia (2007-2010) surveys, including respondents aged 50+ from both countries. This way we can account for and study possible selection effects, age structure differences as well as (dis)advantage in later life health. Binary logistic regression results show that Russians in Estonia have 1.5 – 1.6 times higher odds of impairment for verbal learning than that of Estonian men and women while the differences in impairment do not differ compared with Russians in Russia. Slightly better odds of fluency impairment among Russians in Estonia do not differ significantly compared with Russians in Russia and Estonians. Somewhat contradictory results for the foreign-origin population depending on the cognitive functioning outcome suggest that migration may affect cognition domains differently. In general, the higher impairment in both cognitive functioning among men than women potentially indicates the beneficial effect of women being slightly better educated than men in the region, but also to selective survival of people in better (cognitive) health, resulting in large life expectancy gender gaps, especially in Russia. In general, the included variables explain and reduce differences in impairment little, with more reduction happening for the foreign-origin population in Estonia compared with the sending than compared with the host country population.

Keywords

migrant health; verbal learning; verbal fluency; old age

1. Introduction

Studies on health and migration have most commonly found support for the so-called “healthy immigrant effect”, indicating that migrants’ health is better than that of the native population, also contributing to the population-level health and mortality outcomes (e.g. Elo et al. 2004, Palloni & Ariès 2014, Syse et al. 2016). More mixed results exist, depending on the origin and length of residence of migrants (e.g. Kohler & Preston 2011, Helgesson et al. 2019). Most of the literature on the topic has focussed on Western countries and younger migrants, with some exceptions for Eastern Europe indicating that compositional factors explain the healthy migrant effect (Buckley et al. 2011). Some studies focusing on other health measures instead of mortality and on middle-aged and older people have found worse health outcomes among foreign-born than native populations (e.g. Crimmins et al. 2007, Solé-Auró & Crimmins 2008, Walkden et al. 2018).

Cognitive functioning has been proposed as one of the indicators of the burden of ageing because of the increasing role of cognition in societies with the transformation of work and social life (Skirbekk et al., 2012). With population ageing, it is important to understand the scope and health care implications for the potential dementia burden in different societies, and which population groups are affected most. Despite several studies comparing the cognitive health of migrants and their descendants to native populations, the findings are still inconsistent about the foreign-origin population’s position in cognitive health with respect to other population groups (Xu et al. 2017, Hill et al. 2012). Single studies have compared cognitive health of migrants to cognitive functioning of their sending country population or both the sending as well as the host country population, finding that migrants have worse cognitive impairment (e.g. Plitas et al. 2009, Zeki Al Hazzouri et al. 2011) or that migrants do not differ from non-migrants (Mejia et al. 2006).

Generally, age, language skill (incl. bilingualism, proficiency of the host country language) and education have been strongly associated with cognitive functioning (Xu et al. 2017, Kaplan et al. 2011, Mejia et al. 2006, Zeki Al Hazzouri et al. 2011). Educational levels and quality are usually reflected in socio-economic (SES) status; low SES is likely to be associated with worse cognitive performance, but also with worse access to health care services, and through that affect cognitive functioning (Kaplan et al. 2011, Xu et al. 2017). However, the negative link with lower SES has been mostly confirmed for Hispanics in the North-American context, similar associations in non-Western societies have not been confirmed (Xu et al. 2017). Furthermore, chronic health conditions, lifestyle factors and adverse experiences vary between different origin groups, influencing cognitive functioning as well (ibid). Finally, early life conditions (e.g. parental education) may mediate some of the life pathways, influencing also later life cognitive

performance (Zeki Al Hazzouri et al. 2011). There are several measurement issues to be considered, which become pertinent when comparing different origin groups (Plitas et al. 2009). Some authors use specially adjusted cognitive health measures when comparing different populations because normative measures that have developed in Western countries may erroneously result in false-positive outcomes (Mejia et al. 2006, Plitas et al. 2009).

As Europe has become one of the main immigration destinations over the last decades, migrants and their descendants form 18% of the European Union population; of them 52 % are from outside Europe. With a 1.8 million migrant community, Russians constitute one of the largest foreign-origin groups in Europe (Eurostat 2018). Estonia is the third highest in Europe for the proportion of its foreign-born population and their descendants (33 %), and first for the share of the second generation foreign-origin population group (21.5 %) (Statistics Estonia 2011, Eurostat 2018). The majority of migrants and their descendants in the country are Russians, having been formed since the post-World War II decades when the country was incorporated into the Soviet Union (Sakkeus 1994). This confirms our motivation to focus on the Russian-origin population in Estonia comparing them to Estonians in Estonia and Russians in Russia, providing a unique design setting not yet tested elsewhere. The migration circumstances as well as the general societal features have been quite different from Western countries for most of the life of the current middle-aged and older people in Estonia and Russia, making it an interesting case.

The migration policies of the Soviet Union created incentives to move for labour reasons, and were to a great extent facilitated by centralised policies. Migrants received housing in a facilitated manner, being favoured due to belonging to the labour force needed for economic development (especially construction, industry and government employees), and because housing was a deficit product (Kährik 2006). Due to the large migration turnover, only about 11% of migrants remained in Estonia by the beginning of the 1990s (Katus et al. 2002). Only about 4% of the current foreign-origin population in Estonia arrived after regaining independence in 1991 (Sakkeus 2007). The age structure of the foreign-origin population was relatively young compared to the native Estonian population due to the constant in-flow of migrants until the 1990s (Katus & Puur 2006). The educational structure of people who remained in Estonia, display equivalent levels to those of the native Estonian population (Sakkeus 2007). However, despite the educational levels, the foreign-origin population was often employed in fields that were better paid, but required less qualification (Puur & Sakkeus 1999) due to the Soviet specificity of preferring working class (e.g. wage differences were in favour of industrial and agricultural workers (Klesment & Sakkeus 2010)). Also, the health of migrant population in Estonia has been constantly worse than that of

the native population, mostly due to health behaviour differences (Sakkeus & Karelson 2012, Baburin et al. 2011).

Both Estonia and Russia experienced life expectancy stagnation for more than 40 years since the 1960s, particularly among men in Russia. The trend for non-Estonian men followed that of Russian men since the 1970s, however since 1998 it has rather followed the trend of Estonian men (Sakkeus 2007). By 2009, the life expectancy of non-Estonian men was 67 years and for non-Estonian women 79.4, remaining between Estonians and Russians in Russia (Statistics Estonia 2021, Human Mortality Database 2021). The large gender gap in life expectancy in both countries is caused by excessive mortality of working age men with the most widespread causes of death being cardiovascular diseases and external causes such as accidents and violence (Baburin et al. 2011, Sakkeus 2007, Shkolnikov et al. 2001). Consequently, the healthy life expectancy (HALE) has been low in the region relative to other European countries with Estonian HALE being higher than in Russia. The gap between the two countries increased between 2000 and 2010. In 2010, male HALE was 56.2 years at birth, and 11.0 years at the age of 60, which was respectively 7.1 and 2.4 years less than for men in Estonia. Female HALE was 64.9 years at birth and 15.1 years at the age of 60, being 5.3 and 2.8 years less than for women in Estonia (WHO 2021).

The health care systems of both countries have a common socialist past focusing on infectious diseases, with poor technological equipment and insufficient training to address emerging chronic and age-related illnesses. Even though the economic, legal, social and health care system was common since the post-World War II decades until 1991, the economic recovery as well as improvements in the social and health care sphere were faster in Estonia than Russia since then. A distinct feature of the Estonian case is that much of the education, media, social and health care services remained available in Russian language after 1991, making it also possible for Russians in Estonia to continue using them in their own language. Health care expenditure constituted 7% of the Estonian GDP and 5.4% in Russia in 2009 (OECD 2011). The share of out-of-pocket (OOP) payments increased in the 1990s in both countries, but reached 20% in Estonia by the 2000s, and almost 29% in Russia by 2009 (OECD 2019, Popovich et al., 2011). Most of these costs were spent on pharmaceuticals, affecting vulnerable population groups the most (Lai et al., 2013). The reduced availability of free health care and drug therapy among the older population in Russia may be responsible for unmet medical assistance and trigger chronic diseases, including the development of cognitive impairments (Selezneva et al., 2020).

Ten years ago, both countries lacked an effective health care system for age-related diseases and long-term care. However, launching a systemic health care reform at the end of the 1990s,

developing nursing care homes, increasing the availability of psychiatrists and support from family doctors makes Estonia better prepared to address the health of older adults, including dementia compared with Russia (Jasilionis, et al., 2011, Koppel et al., 2008). The massive development of outpatient geriatric care aimed at monitoring and caring for patients and providing them with some supportive therapy began in Russia only in 2017. Until then, older adults with self-care problems (incl. from mental disorders) received only care services in the shadow market or help from relatives. Mental health care was provided by poor quality services for people with severe mental disorders, not focusing on prevention or treatment of these diseases (Popovich et al. 2011).

The proportion of 60+ people with dementia in Russia (4.9%) was lower than in Estonia (5.3%), remaining below the OECD average in both countries in 2009 (OECD 2011). This can be explained by relatively low life expectancy (not many people survive up to their dementia) and insufficient disease detection due to attitudes (Shulman & Adams, 2002). However, the dementia prevalence is expected to increase to 17% in Russia and 26% in Estonia by 2050 (OECD 2019).

The paper's main aim is to analyse the cognitive functioning of the non-institutionalised middle-aged and older population, comparing Russian origin population in Estonia with Estonians in Estonia and Russians in Russia. Such a design enables us to consider possible selection effects, age structure differences, and the role of (dis)advantage in later life health when studying migration or migrant effects on population health. Since the migration event itself has taken place already relatively long time ago in the lives of the foreign-origin population, we can estimate long-term effects (and are less concerned with immediate effects of the move itself). Given the generally worse health and mortality indicators among Russians in Estonia as well as in Russia, and the lower dementia prevalence in Russia, we expect that the cognitive functioning outcomes of Russians in Estonia remain in-between those of Estonians' and Russians'.

2. Data and Methods

2.1. Samples

We use data from two surveys aimed at studying individual ageing pathways - the SHARE (Survey of Health, Aging and Retirement in Europe) and the SAGE (The Study on Global Ageing and Adult Health) surveys. Both targeted people aged 50+, and included also partners of the main respondents. SHARE is a multidisciplinary study, and it is based on the U.S. Health and Retirement Study. SAGE is designed by the World Health Organization, and has a more health focus.

The first wave of the Estonian SHARE data was carried out in 2010-2011. The sample frame of SHARE Estonia was based on a population register which allowed drawing age-eligible target individuals from each household. Stratified sampling with simple random sampling of individuals within strata was used. Stratification was done by gender and year of birth. Within each gender-age stratum records are sorted by region to get better geographical allocation. Prior to fieldwork the sample was double-checked with the death registry to exclude any possible deaths that happened after sampling. Household response rate for Estonia was close to 60%. (Malter & Börsch-Supan 2013). The language of the SHARE Estonia survey depended on the respondents' preference – it was conducted in Estonian or in Russian with most of the Russians in Estonia choosing the Russian language. Therefore, also the words in cognitive functioning measures were different, depending on the language of the survey. The words used in cognitive functioning measures in the Russian language questionnaire were somewhat different from the Russian SAGE survey cognitive functioning items, however, they reflect different spheres of daily speech (Sirbekk et al. 2012), and were developed by local psychologists, based on the international measures (Shao et al. 2014).

The SAGE Russian survey Wave 1 was carried out in 2007-2010. The national sample was constructed using data from two sources: the sample for the 2003 World Health Survey (WHS) and the 2002 population census. The aim of the sampling design was to obtain a nationally representative cohort of persons aged 50 years and older, with a smaller cohort of persons aged 18 to 49 for comparison. We use here data on people aged 50+. Total individual response rate was 71.8% for SAGE. (WHO 2014)

For the purpose of this paper, we choose people living in urban areas. Since over 90% of Russians in Estonia have settled in urban areas, then choosing only urban dwellers helps to reduce possible selection effects on area of residence. Also, we ran analyses distinguishing first and second generation Russians in Estonia, but the number of cases for some variables was too small to make reliable conclusions.

2.2. Variables

We analyse three cognitive function outcomes - verbal fluency, immediate verbal recall and delayed verbal recall which measure and reflect certain types of cognitive ability domains (memory and semantic fluency). It may be difficult to distinguish when cognitive impairment is a manifestation of dementia or serious clinical condition from when it is just one of normal age-related effects (Deary et al. 2009). Some studies suggest using group-associated percentile-based

cut-off thresholds to indicate cognitive impairment to reflect people who have a serious clinical condition (Brody et al., 2019, Deary et al., 2009).

Verbal fluency refers to the ability to produce as many words as possible in a one-minute time span, assessing information retrieval from semantic memory and measuring crystallised knowledge that is accumulated over a long time span. According to SHARE criteria, a score of less than 18 items represents impairment in word fluency (Börsh-Supan et al. 2005). Immediate and delayed verbal recall assesses learning capacity, memory storage and memory retrieval, being measures of a temporary kind of working memory. These are tested by presenting ten words successively, after which the respondent is given the opportunity to recall as many words as possible. In SAGE this was repeated three times to saturate the learning curve while in SHARE this was repeated two times. After about 5 minutes in SHARE and 10 minutes in SAGE, delayed recall and recognition were tested again. According to SHARE criteria, a score of 4 or less represents impairment in verbal learning and recall (Börsch-Supan et al. 2005).

The measurement of verbal recall (or immediate recall) is most similar in both Estonian and Russian survey. The measurement of delayed recall was slightly different – in the SHARE survey a list of words was asked to be repeated two times, while in the SAGE survey it was asked to be repeated three times, but each time before repetition the list was given anew (WHO 2014 SAGE Questionnaire). While the fluency test was seemingly similar in both surveys, the outcomes are twice lower for this indicator in SAGE than SHARE, indicating to unidentified measurement differences. In order to have comparable measures for both surveys, we use a 25%-percentile-based cut-off threshold for each group and for both cognition outcomes separately, following some examples (Brody et al., 2019, Deary et al., 2009). As a result, the cut-off points for fluency appear below the suggested international thresholds; however, we believe that this allows for a more suitable comparison. Due to comparability issues, we present results only for fluency and immediate recall.

We distinguish migrant groups by self-reported ethnicity as this is comparable in both surveys by including Estonians in Estonia, Russians in Estonia (both first and second generation) and Russians in Russia. Furthermore, we include only those Estonians who were born in Estonia and whose mother was born in Estonia. The Russian SAGE survey allowed to distinguish those who had been living most of their adulthood or childhood abroad – we did not include them in our analytical sample to reduce potential migration effects. This leaves us with 2365 Estonians, 1373 Russians in Estonia, and 2339 Russians in Russia (total N=6077).

Models are run separately for men and women. Control variables were included step-by-step, and cover most of the associated factors, such as demographic, socio-economic, psychosocial, health and health behaviour, found relevant in the literature (Xu et al., 2017, Xu et al., 2018) and that were asked in both surveys. Specifically, these include age (at interview), marital status (married or partnered/ separated or divorced/ widowed/ never married), total years spent in education, employment status (in employment/retired/ at home, ill, other), evaluation of the current financial situation (having difficulties or not), ownership status of dwelling (owner/ other), self-rated health ((very)bad/ fair/ (very) good), depressiveness, smoking and alcohol consumption, BMI (NA/ <18.5/18.6-22.9/ 23-24.9/25-29/ 30-34.9/35+), satisfaction with personal relations, trust in people, receipt of care/ help, mother's education (NA/ below secondary/ secondary or highest), father's education (NA/ below secondary/ secondary or highest). The comparison of questions and response options that have differed in the surveys of the two countries and how they have been transformed for the use of the current analysis are presented in Table 1 (Appendix).

3. Results

3.1 Descriptive Results

Descriptive statistics of the three population groups are presented in Tables 2 and 3. Russians in Estonia are on average slightly younger than Estonians, but older than Russians in Russia (men 66.5 years, women 67.5 years). If different migrant generations were separated, the first generation would be the oldest group, while the second generation would be the youngest group by almost ten years.

Immediate recall and fluency averages are generally slightly higher among women than men, except for Russians in Russia (Table 2). Among men, the average immediate recall is lowest among Russians in Estonia (4.6 words), followed by Estonians, while it is highest among Russians in Russia (5.3 words). Among women, also Russians in Estonia have the lowest average immediate recall (5.0 words), followed by Russians in Russia, and then Estonians (5.5 words). The gender differences in immediate recall are significant for Estonians and Russians in Estonia, but not for Russians in Russia. Mean fluency scores are also lower for Russians in Estonia than Estonians, among both women and men (while Russians in Russia show averages which are two times lower than those recorded in SHARE, indicating to some measurement differences). The gender differences in fluency scores are not significant for any group.

Table 2. Descriptive results for cognitive functioning outcomes of different population groups aged 50+, SHARE Estonia 2010- 2011 and SAGE Russia 2007-2010

	Estonians		Russians in Estonia		Russians in Russia	
	Women (N=1431)	Men (N=934)	Women (N=843)	Men (N=530)	Women (N=1579)	Men (N=760)
Verbal fluency (Mean (CI))	22.1 (21.7 - 22.5)	21.5 (21.0 - 21.9)	20.2 (19.7 - 20.7)	19.7 (19.1 - 20.4)	12.1 (11.7 - 12.4)	12.2 (11.6 - 12.7)
Immediate recall (Mean (CI))	5.5 (5.4 - 5.4)	5.0 (4.9 - 5.1)	5.0 (4.9 - 5.1)	4.6 (4.4 - 4.8)	5.2 (5.1 - 5.3)	5.3 (5.2 - 5.4)
Fluency impairment (%)	20.61	21.63	20.76	21.70	23.81	23.82
Immediate recall impairment (%)	11.18	16.81	20.40	24.34	13.55	14.08

Due to some measurement differences, looking at the proportion of impaired people might give a better overview from a comparative perspective. Among both women and men, Russians in Russia have the largest proportion of people with impaired fluency (Table 2). Russians in Estonia have the highest share of people impaired in immediate recall, while Russians in Russia and Estonian women have the lowest share of impaired in this indicator.

3.2 Immediate Recall

The unadjusted binary logistic regression models for verbal learning (immediate recall) indicated that Russian men in Estonia had almost twice higher impairment odds than Russian men in Russia, and about 1.5 times higher odds of impairment compared to Estonian men in Estonia. For women, the unadjusted odds were twice higher among Russians in Estonia than Estonian women, and 1.6 times higher than for Russians in Russia. The included variables reduced the group differences, except with Estonian men. Finally adjusted regression models for immediate recall show that Russians in Estonia have significantly higher odds of cognitive impairment compared to Estonians among both men and women (Table 4). Final impairment odds remain about 1.5 times higher for Russian men in Estonia compared with Estonian men, and 1.3 times higher compared with Russian men in Russia (although the latter is not significantly different). Final impairment odds among women remain 1.6 times higher for Russians in Estonia compared with Estonian women, and 1.2 times higher compared with Russian women in Russia (the latter not significantly different).

Although the odds of impairment for Russians in Estonia are initially also significantly higher than those of Russians in Russia, the differences decrease among both men and women after controlling for health behaviour and social factors, and disappear completely after adjusting for parental education. In general, all the included variables do not explain much of the impairment differences, remaining between 16.4% and 19.7%, depending on the population group. The variables explain more differences for women than men though, and compared with Russians in Russia than with Estonians.

Therefore, Russians in Estonia have worse cognitive impairment than other observation groups with regard to the immediate recall measure, but it remains significantly worse only compared with Estonians after all variables have been adjusted for.

Interaction models with gender (not presented here) indicate that men have 1.4 -1.7 times higher odds of impairment than women among all groups.

Table 3. Descriptive results for different population groups aged 50+, SHARE Estonia 2010- 2011 and SAGE Russia 2007-2010

	Estonians Women (N=1431)				Russians in Estonia Women (N=843)				Russians in Russia Women (N=1579)			
	N	Mean (CI)/ %	N	Mean (CI)/ %	N	Mean (CI)/ %	N	Mean (CI)/ %	N	Mean (CI)/ %	N	Mean (CI)/ %
Age (mean)		68,5 (68,0 - 69,0)		67,5 (66,9 - 68,1)		67,5 (66,8 - 68,2)		66,5 (65,7 - 67,4)		66,6 (66,1 - 67,1)		64,5 (63,8 - 65,2)
Years of education (mean)		12,0 (11,8 - 12,2)		11,9 (11,7 - 12,1)		11,2 (10,9 - 11,4)		11,5 (11,2 - 11,8)		11,2 (11,0 - 11,3)		11,5 (11,2 - 11,7)
Married/partnered	691	48.29	728	77.94	455	53.97	445	83.96	650	41.17	579	76.18
Separated/ divorced	229	16.00	91	9.74	124	14.71	50	9.43	159	10.07	62	8.16
Widowed	383	26.76	58	6.21	232	27.52	22	4.15	718	45.47	106	13.95
Never married	128	8.94	57	6.10	32	3.80	13	2.45	51	3.23	13	1.71
In employment	528	36.90	395	42.29	254	30.13	203	38.30	463	29.32	303	39.87
Retired	845	59.05	488	52.25	541	64.18	300	56.60	954	60.42	354	46.58
Other	58	4.05	51	5.46	48	5.69	27	5.09	149	9.44	101	13.29
Livign alone (%)	507	35.43	113	12.10	267	31.67	56	10.57	581	36.80	132	17.37
Difficulties with economic situation	114	7.97	49	5.25	203	24.08	63	11.89	499	31.60	180	23.68
Own dwelling	940	65.69	460	49.25	576	68.33	242	45.66	###	91.07	692	91.05
Self-rated health: (very) bad	340	23.76	264	28.27	309	36.65	142	26.79	512	32.43	181	23.82
Self-rated health: medium	678	47.38	412	44.11	415	49.23	266	50.19	914	57.88	435	57.24
Self-rated health: (very) good	412	28.79	256	27.41	119	14.12	121	22.83	151	9.56	141	18.55
Depressed	574	40.11	270	28.91	456	54.09	170	32.08	769	48.70	240	31.58
BMI: DK/NA/R	34	2.38	15	1.61	25	2.97	5	0.94	50	3.17	25	3.29
BMI: <18.5	22	1.54	5	0.54	7	0.83	5	0.94	22	1.39	11	1.45

BMI: 18.5 - 22.9	216	15.09	118	12.63	101	11.98	85	16.04	145	9.18	99	13.03
BMI: 23.0 - 24.9	233	16.28	187	20.02	93	11.03	101	19.06	180	11.40	132	17.37
BMI: 25.0 - 29.9	530	37.04	399	42.72	320	37.96	221	41.70	601	38.06	359	47.24
BMI: 30.0 - 24.9	292	20.41	154	16.49	185	21.95	84	15.85	367	23.24	104	13.68
BMI: 35.0 +	104	7.27	56	6.00	112	13.29	29	5.47	214	13.55	30	3.95
Current smoker	152	10.62	248	26.55	94	11.15	172	32.45	76	4.81	320	42.11
Alcohol drinking: DK/ NA / R	2	0.14	0	0.00	1	0.12	4	0.75	439	27.80	79	10.39
Alcohol: Never	678	47.38	261	27.94	424	50.30	152	28.68	291	18.43	91	11.97
Alcohol: Sometimes	646	45.14	310	33.19	384	45.55	233	43.96	825	52.25	457	60.13
Alcohol: Often	105	7.34	363	38.87	34	4.03	141	26.60	24	1.52	133	17.50
Satisfaction with relations: DK/NA/R	29	2.03	36	3.85	16	1.90	28	5.28	21	1.33	14	1.84
Satisfaction with relations: dissatisfied	11	0.77	26	2.78	22	2.61	5	0.94	98	6.21	31	4.08
Satisfaction with relations: neutral/medium	75	5.24	57	6.10	40	4.74	38	7.17	242	15.33	81	10.66
Satisfaction with relations: satisfied	###	91.89	815	87.26	765	90.75	459	86.60	###	76.19	630	82.89
Trust in people: DK/NA/R	26	1.82	38	4.07	15	1.78	28	5.28	16	1.01	7	0.92
Trust in people: no/ low trust	183	12.79	128	13.70	88	10.44	89	16.79	465	29.45	254	33.42
Trust in people: (high) trust	###	85.39	768	82.23	740	87.78	413	77.92	###	68.71	495	65.13
Receipt of care: DK/NA/R	161	11.25	195	20.88	68	8.07	109	20.57	19	1.20	9	1.18
Receipt of care: no	933	65.20	584	62.53	589	69.87	345	65.09	###	75.74	630	82.89
Receipt of care: yes	337	23.55	155	16.60	186	22.06	76	14.34	362	22.93	119	15.66
Education of mother: DK/NA/Other	295	20.61	259	27.73	351	41.64	225	42.45	77	4.88	49	6.45
Education of mother: <secondary	828	57.86	473	50.64	331	39.26	207	39.06	###	68.27	493	64.87
Education of mother: secondary +	308	21.52	202	21.63	161	19.10	98	18.49	424	26.85	218	28.68
Education of father: DK/NA/Other	374	26.14	291	31.16	339	40.21	227	42.83	200	12.67	75	9.87

Education of father: <secondary	730	51.01	429	45.93	305	36.18	184	34.72	894	56.62	414	54.47
Education of father: secondary +	327	22.85	214	22.91	199	23.61	119	22.45	485	30.72	271	35.66

3.3 Fluency

For the fluency indicator, Russians in Estonia on the whole have lower odds of impairment than Estonians and Russians in Russia among women, and lower odds of impairment than Russians in Russia among men, but none of these differences are significant (Table 4). Also, the odds of impairment compared with Estonian men do not differ. The significantly higher impairment in fluency among Russian women in Russia compared with Russian women in Estonia emerges after controlling for age, but disappears again after controlling for other demographic factors such as marital status and household size. In all other cases, none of the variables included in the models change the position or the significance level of odds of impairment.

The included variables explain little of the impairment differences between groups, even less than in the case of fluency – 13.9% for men and 15.5% for women. Again, the variables explain more differences in case of women than men.

Interaction models with gender (not presented here) indicate that men have 1.3 -1.6 times higher odds of impairment than women among all groups.

Table 4. Coefficients from finally adjusted logistic regression models for different population groups aged 50+, SHARE Estonia 2010- 2011 and SAGE Russia 2007-2010

	Immediate recall		Fluency	
	Men	Women	Men	Women
Estonians	0.674 (0.494 - 0.922) *	0.616 (0.462 - 0.821)***	0.988 (0.733 - 1.332)	1.228 (0.954 - 1.580)
Russians in Estonia (reference)	1	1	1	1
Russians in Russia	0.780 (0.519 - 1.172)	0.809 (0.582 - 1.125)	1.036 (0.720 - 1.489)	1.223 (0.917 - 1.632)
R²	0.1639	0.1970	0.1399	0.1549
N	2096	3712	2096	3712

4. Discussion

As cognitive functioning becomes an increasingly relevant aspect of health in ageing societies, it is important to identify its main risk factors and groups. Since working memory is a temporary type of memory that starts to show deficiencies more easily than in the case of crystallised knowledge, it can be used as an indicator that predicts dementia onset. Based on both verbal learning and fluency measures observed here we can conclude that the minimum share of older people at risk of impairment is around 20-24% among the middle-aged and older foreign-origin population in Estonia. It is about 11-17 % for Estonians and 13-14% for Russians in Russia based on the immediate recall indicator, but reaches also above 20% in case of fluency for both groups. These shares are closer to the predicted dementia burden for Estonia and Russia by 2050 (OECD 2019), therefore they might slightly overestimate the actual share of people with a clinical condition.

Contrary to expectations of the healthy migrant effect, our analysis finds that migrant origin population groups in Estonia have the highest risk of cognitive health impairment. This conclusion holds only for immediate recall outcome though, whereas the slight advantaged position of the foreign-origin population in fluency can be considered not different compared with non-migrants. The first finding is in line with previous findings of the Estonian and Russian epidemiological and mortality developments, showing that the health and life expectancy of the foreign-origin population is worse than that of Estonian native population (Groenewold & van Ginneken 2011, Baburin et al. 2011, Sakkeus 2007, Shkolnikov et al. 2001), but also confirm previous results on migrant health in other international settings that have studied middle-aged and older population, including a multiple country design setting or analysing different health outcomes besides mortality (e.g. Plitas et al. 2009, Zeki Al Hazzouri et al. 2011, Crimmins et al. 2007, Solé-Auró & Crimmins 2008, Walkden et al. 2018). The outcome for fluency, however, rather confirms findings where no differences between migrants and non-migrants have been found (e.g. Mejia et al. 2006).

However, the fact that cognitive impairment of Russians in Russia is not generally worse than that of Russians in Estonia contradicts earlier findings on health in the region. This suggests that since mortality has been higher for decades in Russia compared to Estonians and Russians in Estonia, the population in older age has become selective in terms of (cognitive) health – only those with better health have survived to this age. However, in the long run, when life

expectancy will rise in Russia to comparable levels with other countries, this advantage will disappear.

Somewhat contradictory findings for Russians in Estonia between fluency and immediate recall indicate that the effect of migration experience may differ, depending on the cognitive functioning outcomes. Crystallised knowledge that fluency measures, does not seem to be affected by the migration experience, unlike working memory. Possibly, the fact that the middle- and older generation Russians in Estonia have not had to learn Estonian language due to being able to keep using Russian language in daily activities and services, has even had a somewhat detrimental effect on verbal recall since migrants have not had to “train” the language learning skill or they have not been selected on the language ability (Hill et al.2012). People with multiple language skills tend to have better cognitive functioning (Shao et al. 2014).

Unlike many previous studies, the higher average education levels among women than men were observed for most of the population groups, except for Russians in Russia, indicating to some selection effects. Firstly, better educated men have survived longer, and have therefore been more likely to be captured by the surveys, especially in Russia where the gender gap in life expectancy is the largest. Also, the proportion of impaired people is lower among women than men for both immediate recall and fluency for all population groups. This is reflected also in higher risk of impairment among men for most observed groups. Years spent in education explain and reduce some of the differences in cognitive impairment between Russians in Estonia and Russians in Russia. Parental education explains away remaining differences in immediate recall between Russians in Estonia and Russians in Russia, among both men and women. These findings support somewhat the previous results on the important role of person’s own education as well as parental socio-economic status in later life cognitive health (Kaplan et al. 2011, Xu et al. 2017). Some health behaviour differences between Russians in Russia and Russians in Estonia accounted for recall impairment differences, confirming also some of the earlier explanations on the development of illnesses and causes of death in both countries (Baburin et al. 2011, Sakkeus 2007, Shkolnikov et al. 2001).

Similarly to restructuring the health and social care systems to correspond infectious or cardiovascular diseases in earlier times, it is time for increasing national investments and attention to address and prevent cognitive health challenges. This includes also addressing the general attitudes of people regarding those with dementia and other mental illnesses (Schulman & Adams 2002), especially to identify potential cognitive health risks among men.

4.1. Strengths and Limitations

This study used a unique opportunity to compare foreign-origin population groups to the host country population as well as the sending country population, using similar measures from ageing surveys of SHARE and SAGE. This allowed considering potential selection, age structure effects as well as differences in economic and social circumstances. The study contributes to the literature on migration and health by considering the long-term effects of migration on later life cognitive health, finding that migration effect may differ, depending on the cognitive functioning outcome, or that it may be non-existent. We also tried to distinguish first generation migrants and their second generation descendants, but the number of cognitively impaired second generation Russians in Estonia was too small to be able to make meaningful conclusions.

Some differences in measurement still exist between different groups that may also influence our results. First, the language of the survey was conducted in the preferred language of the respondent in Estonia – either in Estonian or Russian, and language differences are a well-known influencing factor in cognition outcomes. Secondly, even though Russians in Estonia and in Russia replied to the questionnaire in Russian language, using cognitive functioning measures in Russian language, the recall lists included slightly different words, potentially influencing the memorisation of them. We have also not adjusted for language skills or bilingualism, which tends to have a positive effect on cognitive functioning (Shao et al. 2014). Finally, although we included only variables from both surveys that were possible to transform into comparable versions, some measurement differences may still affect the outcomes.

Selection issues have to be considered as well. First, higher mortality of Russian men causing the large gender gap in life expectancy might have resulted in a more selective survival of Russians in Russia compared to Russians or Estonians in Estonia. Therefore, also the sample of SAGE is potentially quite selective, with people in better health being more likely to be included as respondents of the survey.

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Appendix

Table 1. Construction of variables in the analysis based on questions from SAGE and SHARE

Topic	SHARE	Response options	SAGE	Response options	Variable in analysis
Financial situation	Thinking of your household's total monthly income, would you say that your household is able to make ends meet?	1. With great difficulty, 2. With some difficulty, 3. Fairly easily, 4. Easily Yes/ No	Would you say your household's financial situation is...?	Very good / Good / Moderate / Bad / Very bad	1. Have difficulty (incl SHARE: "With great difficulty" and SAGE: "Bad/ Very bad"); 0. OK
Smoking	Do you smoke at the present time?	Yes/ No	Do you currently use (smoke, sniff or chew) any tobacco products such as cigarettes, cigars, pipes, chewing tobacco or snuff?	Yes/ No	1. Current smoker; 0. Not a current smoker
Alcohol drinking	During the last 3 months, how often did you drink any alcoholic beverages, like beer, cider, wine, spirits or cocktails?	Daily or almost every day , Five or six days a week , Three or four days a week , Once or twice a week Once or twice a month, Less than once a month, Not at all in the last 3 months Yes/ No	In the last 12 months, how frequently [on how many days] on average have you had at least one alcoholic drink?	No days, < 1 per month , 1-3 days per month, 1-4 days per week, 5+ days per week	1. Never (incl. SAGE: "No Days"; SHARE "Not at all..."); 2. Sometimes (SAGE: "< 1 per month" , "1-3 days per month"; SHARE: "Once or twice a month", "Less than once a month"), 3. Often (SAGE/ SHARE: 1+ a week)
Depression	In the last month, have you been sad or depressed?	Yes/ No	During the last 12 months, have you had a period lasting several days when you felt sad, empty or depressed?	Yes/ No	1. Depressive caseness (SAGE: Yes for all three questions; SHARE: Yes for three issues), 0. No
	What are your hopes for the future?	1. Any hopes mentioned 2. No hopes mentioned	During the last 12 months, have you had a period lasting several days when you lost interest in most things you usually enjoy such as personal relationships, work or hobbies/recreation?	Yes/ No	depressiveness
	In the last month, have you felt that you would rather be dead?	1. Any mention of suicidal feelings or wishing to be dead 2. No such feelings	During the last 12 months, have you had a period lasting several days when you have been feeling your energy decreased or that you are tired all the time?	Yes/ No	
	Do you tend to blame yourself or feel guilty about anything?	1. Obvious excessive guilt or self-blame 2. No such feelings 3. Mentions guilt or self-blame, but it is unclear if these constitute obvious or excessive			

guilt or self-blame

Have you had trouble sleeping recently?	1. Trouble with sleep or recent change in pattern 2. No trouble sleeping
In the last month, what is your interest in things?	1. Less interest than usual mentioned 2. No mention of loss of interest 3. Non-specific or uncodeable response
Have you been irritable recently?	Yes/ No
What has your appetite been like?	1. Diminution in desire for food 2. No diminution in desire for food 3. Non-specific or uncodeable response
In the last month, have you had too little energy to do the things you wanted to do?	Yes/ No
How is your concentration? For example, can you concentrate on a television programme, film or radio programme?	1. Difficulty in concentrating on entertainment 2. No such difficulty mentioned
What have you enjoyed doing recently?	1. Fails to mention any enjoyable activity 2. Mentions ANY enjoyment from activity
In the last month, have you cried at all?	Yes/ No

Trust	Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people? Not looking at card 35 anymore, please tell me on a scale from 0 to 10, where 0 means you can't be too careful and 10 means that most people can be trusted.	Scale 0 ... 10	Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?	1. Can be trusted 2. Can't be too careful	1. Low/ No trust (SAGE: 2; SHARE: 0...4), 2. Trust in people (SAGE: 1; SHARE: 5...10)
Satisfaction with social relations	Overall, how satisfied are you with the relationships we have just talked about? Please answer on a scale from 0 to 10 where 0 means completely dissatisfied and 10 means completely satisfied.	Scale 0 ... 10	How satisfied are you with your personal relationships?	1. Very satisfied, 2. Satisfied, 3. Neither satisfied nor dissatisfied, 4. Dissatisfied, 5. Very dissatisfied	1. Dissatisfied (SAGE: 4/5; SHARE: 0/4), 2. Neutral (SAGE: 3; SHARE: 5/6), 3. Satisfied (SAGE: 1/2; SHARE: 7/10)
Receipt of care	Thinking about the last twelve months has any family member from outside the household, any friend or neighbour given you [or/or/or/or] [your/your/your/your] [husband/wife/partner/partner] personal care or practical household help?	Yes/ No	In the last 12 months, has anyone in the household received any financial or in-kind support from your family (children, siblings or parents) and relatives (other kin) who do not live with you?	Yes/ No	1. Has received care (Yes on any of the questions), 0. Has not received care (No on any of the questions)
	Is there any other family member from outside the household, friend or neighbour who has given you [or/or /or/or] [your/your/your/your] [husband/wife/partner/partner] personal care or practical household help?	Yes/ No			
	And is there someone living in this household who has helped you regularly during the last twelve months with personal care, such as washing, getting out of bed, or dressing? IWER: By regularly we mean daily or almost daily during at least three months. We do not want to capture help during short-term sickness.	Yes/ No			