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Population Group Differences in Cognitive Functioning in a National Sample of Israelis Fifty Years and Older

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Abstract

The study evaluates population group differences of Israelis 50 years and older in cognitive functioning. Groups were defined based on year of arrival and preferred language (e.g., veteran Jewish Israelis- $n=1,974$; new immigrants from the former Soviet Union- $n=187$; and Arab Israelis- $n=331$). Using a cross-sectional analysis of the first wave of SHARE-Israel, we evaluate a representative sample of Israelis over the age of 50 stratified by population group. Cognitive screens assessed include time orientation, arithmetic, verbal learning, verbal recall, word fluency and subjective reading and writing abilities. To evaluate population group differences, we conducted multivariate analyses of each of the cognitive domains, controlling for age, gender, education, household income, and ever smoking. Relative to veteran Jewish Israelis, new immigrants from the former Soviet Unions were more likely to rate their reading ability as impaired (OR=2.47, 95% CI: 1.32-4.60). In addition, there was a significant interaction between population group and education on the arithmetic task (OR=.69, 95% CI: .58-.83). New immigrants from the former Soviet Union were less impaired than the other two groups especially at lower levels of education. New immigrants were more impaired on the verbal learning task (OR=2.65, 95% CI: 1.38-5.07). On the other hand, relative to veteran Israeli-Jews, Israeli-Arabs were significantly less likely to have impaired performance on the verbal recall task (OR=.31, 95% CI=.16-.60). The results demonstrate that overall, new immigrant from the Former Soviet Union exhibit greater difficulties on the verbal tasks, but not on the arithmetic task. The findings from the current study are somewhat in contrast with the international literature which tends to show that the majority culture outperforms relative to ethnic minorities.

Keywords

Ethnicity; epidemiology; religion; disparities; immigration

There is increasing interest, in recent decades, in understanding cognitive functioning and in identifying the factors that impact functional decline in late life (Cullum et al., 2000). This is not an easy task, because cognitive functioning is not a uniform global domain. Rather, it is composed of several related areas, including learning, memory, executive function, and attention. These respective cognitive functions can be further subdivided into multiple sub domains, such as verbal learning, visual learning, episodic memory, short term memory, word fluency, abstract reasoning and so on (Treitz, Heyder, & Daum, 2007).

The present research examines cognitive functioning among older Israelis from different population groups. Although research on cognitive functioning is well developed in various countries, particularly in the United States and England, less is currently known about the phenomenon among older people in the Israeli setting. Consequently, the literature review that is reported in the next section draws mainly from studies that were carried out in other countries and is supplemented by the few studies reported on the subject in Israel.

Population Group Differences in Cognitive Functioning

The literature documents several ethnic differences in cognitive performance (Ng, Niti, Chiam, & Kua, 2007; Schwartz et al., 2004), cognitive-decline (Moody-Ayers, Mehta, Lindquist, Sands, & Covinsky, 2005), and cognitive impairment (Shadlen, Siscovick, Fitzpatrick, Dulberg, Kuller, & Jackson, 2006). This body of knowledge consistently shows that people of the majority culture tend to perform better on most cognitive tests when compared to persons from minority groups (Ng et al., 2007; Schwartz et al., 2004), and that they have slower age-related cognitive decline and lower risk for dementia (Shadlen et al., 2006). These differences are partially attributed to educational level and to other life style variables that may distinguish between different ethnic groups, such as familiarity with the majority culture, test-taking skills and language skills (Froehlich, Bogardus, Inouye, 2001; Sachs-Ericsson & Blazer, 2005). However, environmental factors such as educational level and early childhood socioeconomic status only partially explain ethnic differences in cognitive function (Ng et al., 2007; Schwartz et al., 2004). This has lead several researchers to claim that genetic mechanisms, such as ApoE genotype, are also partly responsible for ethnic disparities in cognitive functioning (Fillenbaum, Landerman, Blazer, Saunders, Harris, & Launer, 2001).

Population Group Differences in Israel

Israeli society is comprised of three major groups: veteran Jewish Israelis, new immigrants from the former Soviet Union, and Arab Israelis. This particular grouping of the population has been utilized in several recent epidemiological studies of older adults in Israel (Central Bureau of Statistics, 2004). The differentiation by group is recommended for several reasons. First, even though most older Israelis were not born in Israel, the majority of them came to Israel many decades ago. In contrast, about 19% of older Israelis immigrated to Israel from the former Soviet Union during the great wave of immigration in the early 90's and experienced the relocation process in late life (Central Bureau of Statistics, 2004). The new Russian immigrants are currently older, on average, and more educated than the veteran Jewish-Israeli population. However, they also have lower incomes relative to their veteran Jewish counterparts.

Second of note, is that Arab Israelis—who comprise the third major population group—maintain unique religious and socio-cultural characteristics that distinguish them from the majority Jewish population in Israel. The Arab population represents the largest minority group in the country, with Jewish Israelis encompassing some 77.2% of the total population (Central Bureau of Statistics, 2004). Persons aged 50 and older in the Arab sector constitute about 10% of the 50+ cohort. Arab Israelis are substantially younger, on average, and less educated than Jewish Israelis. In addition, they have lower mean incomes and lower life expectancy. Given the differing characteristics of these three distinguishable population groups in Israel, a comparative study to evaluate whether cognitive abilities do indeed differ by population group is timely and warranted.

As noted already, research on the cognitive functioning of older Israelis has been scarce. Moreover, most of the existing research relies on non-representative samples and on limited cognitive screens. In addition, the majority of such research tends to evaluate each

population group separately, limiting the possibility to compare cognitive functioning across groups. The few studies that have been conducted show that Jewish Israelis demonstrate a similar prevalence rate of dementia as the known prevalence in the West (Treves et al., 1986). While some differences between Jews of different geographical origins have been found, these differences are attenuated when educational level is taken into consideration (Kahana, Galper, Zilber, Korczyn, 2003). In contrast, investigators have found a significantly higher prevalence rate of dementia among the Arabs who reside in Wadi Ara (a geographical area in Northern Israel). However, these high dementia rates are only partially accounted for by established environmental and genetic factors (Bowirrat, Friedland, Farrer, Baldwin, & Korczyn, 2002; Farrer et al., 2003).

The Present Study

The overall goal of the current study was to evaluate population group differences in cognitive functioning using a national sample of Israelis over the age of 50 and comparing the three largest population groups in Israel (veteran Jews, new immigrants from the Former Soviet Union, Arab Israelis). In addition to examination of between-group differences on several cognitive measures, we also look at within-group differences and the impact that various demographic variables have on cognitive performance within each ethnic group. As far as we know, this is the first national study to evaluate the cognitive functioning of community dwelling Israelis. The study has the advantage of evaluating several cognitive domains including orientation to time, verbal learning and recall, word fluency, and arithmetic and of using measures that were specifically tailored for cross-cultural comparisons (Prince et al., 2003). The study also includes a subjective evaluation of respondents' reading and writing abilities.

Given the scarcity of comparative data on population group differences in Israel, in forming our research hypotheses we relied on the general literature that suggests that the majority group tends to outperform relative to the minority group. Hence, we expected veteran Jewish Israelis to perform better on all cognitive tests relative to Arab Israelis, even after controlling for such covariates as age, gender, income, education and health behavior (smoking). In contrast, we had no a-priori hypotheses concerning the new immigrants from the former Soviet Union. This is because, on the one hand, given the significant impact of immigration on mental health one might expect the new Soviet immigrants to have a significantly lower performance than the veteran Jewish Israelis. On the other hand, given the fact that this particular population group is highly educated, it is unclear how it differs from veteran Jewish Israelis in relation to cognitive functioning.

Methods

The analysis uses data from an early release of the first wave of SHARE-Israel, the Israeli component of the Survey of Health, Aging and Retirement in Europe (Borsch-Supan et al., 2005). SHARE is a multidisciplinary study of people age 50 years and older that is based on the U.S. Health and Retirement Study. Sampling for SHARE-Israel was based first on ecological units (statistical areas) and then on households within these units. We first stratified all statistical areas in Israel, taking advantage of the highly segregated residential patterns that exist. The strata are based on the geographical and socio-demographic characteristics of the statistical areas: community size, modal religion in the statistical area (Jews, Moslems, Christian Arab, and Druze, or mixed Jewish-Arab areas), percent of new immigrants from the former Soviet Union, proportion with low education, and areas with high concentration of ultra-orthodox Jews. These criteria are all necessary for the construction of a representative sample of the Israeli population. Data were collected between September 2005 and March 2006 (Litwin & Sapir, 2008).

Questionnaires were administered by trained interviewers in Hebrew, Arabic and Russian, according to the language preferences of the participants. The main survey was executed by means of computer-assisted personal interviews. Specific training was given to interviewers regarding the administration of the cognitive measures. The study was approved by the Institutional Review Board of the Hebrew University of Jerusalem. Participation was voluntary and respondents were able to decline answering any question that they wished not to answer.

Cognitive Functioning Measures

All cognitive measures were obtained in face-to-face interviews by surveyors specifically trained in their administration. The following sections detail the specific measures employed in the current analysis.

Subjective Reading Ability

The SHARE questionnaire evaluates subjective reading ability using the question: “How would you rate your every-day reading ability.” Following SHARE multi-site criterion, responses to this question were dichotomized to reflect those who reported their reading ability to be poor, fair, or good versus those who reported their reading ability to be very good or excellent (Borsch-Supan et al., 2005).

Subjective Writing Ability

The SHARE questionnaire also evaluates subjective writing ability using a similar question: “how would you rate your every-day writing ability.” Here too, responses were dichotomized to reflect those who reported their writing ability to be poor, fair, or good versus those who reported their writing ability to be very good or excellent (Borsch-Supan et al., 2005).

Time Orientation

The SHARE questionnaire assesses participants’ knowledge of year, month, day of the month, and day of the week. To reflect overall time orientation, we summed up all accurate responses (range 0-4). In line with SHARE multi-site criteria, we divided the sample into those who made no errors versus those with one or more errors (Borsch-Supan et al., 2005).

Arithmetic

Arithmetic ability was evaluated using four questions. For example, “if the chance of catching a disease is 10%, how many people out of 1,000 are expected to catch the disease.” Response range was 0 to 4. Following SHARE multi-site criteria, a score of 3 or less was indicative of impairment (Borsch-Supan et al., 2005).

Verbal Learning

The SHARE questionnaire evaluates learning using the adapted 10-Word Delay Recall Test (Prince et al., 2003). The list of 10 words was read to participants and the number of spontaneously recalled words from the list following the first time the list was read was documented. This measure has been used previously in several international studies (Prince et al., 2003). Score range was 0-10. As instructed by SHARE multi-site criteria, a score of 4 or less represented impairment in verbal learning (Borsch-Supan et al., 2005).

Verbal Recall

Five minutes after the verbal learning task, participants were asked to spontaneously recall the list of words. Score range was 0-10. Here too, a score of 4 or less represented

impairment in verbal recall (Borsch-Supan et al., 2005). We should note that, by definition, the verbal recall task highly depends on performance on the verbal learning task.

Word Fluency

The SHARE questionnaire evaluates word fluency using the animal fluency task. Participants were asked to name all the animals they can think of within a one-minute trial. They received one point for each correct animal name. In line with SHARE criteria, a score of 18 or less represented impairment in word fluency (Borsch-Supan et al., 2005).

Other Variables

Population group was the main predictor variable. It was determined according to the language employed during the interview (e.g., Hebrew, Arabic, or Russian, respectively) and immigration date. This enabled classification of respondents into the three major groupings: veteran Jewish Israelis, Arab Israelis, and new immigrants from the former Soviet Union.

Covariates employed in the analysis included age (50-59, 60-69, 70-79, 80+), gender, level of education (primary, secondary, tertiary), household income (divided into quartiles), and health behavior (ever smoked: yes/no). Information on all of the covariates was gathered by means of self-report.

Statistical Analyses

We first ran univariate analyses to obtain descriptive information about the sample. Next, we performed multivariate analyses with each of the cognitive domains as an outcome variable, with population group as a predictor and all other background variables (i. e., age, gender, education, income, and ever smoked) as covariates. In order to evaluate within-group differences, we also assessed for interactions between population group and each of the covariates. Due to multiple comparisons and the relatively large sample size, we considered $p < .01$ as statistically significant in order to avoid spurious findings. To account for the complex sampling design, all analyses were weighted, stratified by population group and clustered by household. All analyses were conducted with intercooled STATA 8, using the *svy* command to adjust for survey design.

Results

Overall, 1,771 households participated in the study (68.6% response rate), with responses received from 2,598 individuals. The base sample included a small number of younger spouses because the primary sampling unit was household (i.e., all persons aged 50 and older who live in the household and spouses regardless of age were eligible). In the present study, analyses were conducted only on respondents who were 50 and older at the time interviews were conducted (2,492 individuals; 8.7% Arabs, 19.0% Russian).

The majority of the sample was between the ages 50-59 (44.1%), female (54.9%), and had secondary level of education (50.4%). There were significant population group differences in gender, level of education, income, and smoking habits. The Arab sample had a larger representation of males and the new immigrants had a larger representation of females (chi-square [2]=110.1, $p = .0004$). In addition, relative to veteran Jewish Israelis, the Arab sample was significantly less educated and new immigrants from the former Soviet Union were significantly more educated (chi-square [4]=680.3, $p < .0001$). Veteran Jewish Israelis had a significantly higher income than the other two groups (chi-square [6]=251.8, $p < .0001$) and were significantly more likely to have ever smoked (chi-square [2]=81.4, $p < .001$). See Table 1 for details.

A total of 47% of the population rated their reading ability as poor, fair, or good and 50% of the population rated their writing ability as poor, fair, or good. Overall, 20% of the population had at least one error on the time orientation task and 53% generated less than 18 animal names on the word fluency task. A total of 78% of the sample made at least one mistake in arithmetic. Last, 49% of the sample was classified as performing at the impaired range on the verbal learning task and 79% demonstrated an impaired performance on the recall task.

Population Group Differences in Cognitive Functioning

With regard to reading ability, employing $p < .01$ as the criterion for statistical significance, we found that new immigrants from the former Soviet Union were more likely to rate their reading as impaired. In addition, older adults and less educated individuals were also more likely to rate their reading as impaired (Table 2). None of the interactions was significant at $p < .01$: population group and gender (OR=1.44, 95% CI:.82-2.53), population group and age (OR=1.21, 95% CI:.53-1.59), population group and education (OR=.84, 95% CI:.69-1.03), population group and income (OR=.99, 95% CI: .99-.99), and population group and smoking (OR=1.03, 95% CI:.89-1.18).

With regard to writing ability, employing the same $p < .01$ level as the criterion for significant results, there were no population group differences. As expected, older age and lower level of education were associated with one's rating of his or her writing ability as impaired (Table 2). Here too, there were no significant interactions between population group and gender (OR=1.51, 95% CI:.85-2.68), population group and age (OR=1.18, 95% CI:.90-1.56), population group and education (OR=.78, 95% CI: .62-.98), population group and income (OR=.99, 95% CI:.99-1.00), and population group and smoking (OR=1.06, 95% CI:.92-1.22).

There were no population group differences on the time orientation task as well. However, older age and lower levels of education were significantly associated with impaired performance on this task. In addition, those at the highest income quartile demonstrated better task performance (Table 3). There were no significant interactions between population group and age (OR=1.27, 95% CI:.89-1.82), population group and gender (OR=.41, 95% CI:.18-.93), population group and education (OR=.94, 95% CI:.74-1.20), population group and income (OR=.99, 95% CI:.99-1.00), and population group and smoking (OR=1.03, 95% CI:.83-1.26).

A significant interaction emerged between education and population group on the arithmetic task. As can be seen in Figure 1, new immigrants from the former Soviet Union were less impaired than the other two groups, especially at lower educational level. In addition, females were more likely to demonstrate an impaired performance on this task. There were no other significant interactions between group and gender (OR=1.19, 95% CI:.71-2.01), group and age (OR=1.23, 95% CI:.85-1.77), group and income (OR=1.00, 95% CI:.99-1.00), or group and smoking (OR=.98, 95% CI:.86-1.12).

On the verbal learning task, there were significant group differences, with new immigrants showing greater impairment on the verbal learning task. Older adults and less educated individuals were also more likely to perform at the impaired range (Table 4). Here too, no significant interactions were apparent between group and gender (OR=.95, 95% CI:.52-1.72), group and age (OR=1.01, 95% CI:.79-1.30), group and education (OR=.89, 95% CI:.73-1.08), group and income (OR=.99, 95% CI:.99-.99), and group and smoking (OR=.97, 95% CI:.84-1.11).

Arab Israelis were significantly less likely to perform at the impaired range on the verbal recall task than veteran Jewish Israelis. In addition, older adults were more likely to demonstrate impaired performance on this task (Table 4). Once again no significant interactions appeared between group and gender (OR=.94, 95% CI:.43-2.06), group and age (OR=.94, 95% CI:.64-1.37), group and education (OR=.85, 95% CI:.65-1.13), group and income (OR=.99, 95% CI:.99-1.00), and group and smoking (OR=.90, 95% CI:.75-1.09).

In contrast, there were no significant population group differences on the word fluency task. But as expected, older age and lower level of education were associated with impaired performance (Table 5). There were no significant interactions between group and gender (OR=1.01, 95% CI:.61-1.66), group and age (OR=.91, 95% CI:.70-1.18), group and education (OR=.88, 95% CI:.72-1.07), group and income (OR=.99, 95% CI:.99-.99), and group and smoking (OR=1.02, 95% CI:.90-1.16) in relation to this outcome variable.

Discussion

The present study is unique because it evaluates the cognitive functioning of Israelis aged 50 years and older, using a national representative sample. To our knowledge, this is the first national study of older Israelis to evaluate cognitive functioning across these three different population groups. Furthermore, the range of cognitive tasks administered in the present study and the fact that these were specifically tailored for cross-cultural comparison allow for a detailed evaluation of a variety of cognitive domains across population groups.

Over half of the sample had impaired performance on the arithmetic task, verbal recall task, and word fluency task and a little less than half of the sample had an impaired performance on the word-learning task. Furthermore, almost half of the sample reported impaired reading and writing abilities. Given the well-established relationship between cognitive function and functional limitations (Moody-Ayers et al., 2005), it is highly likely that a considerable segment of the Israeli population over the age of 50 requires some assistance in daily function.

However, it is important to note that for comparability reasons, we used the universal criteria that are currently in use by SHARE-Europe. While the performance of Israelis on these cognitive tasks falls well within the performance levels that were achieved in some of the European countries (e.g., France or Italy on the arithmetic task), other European countries have demonstrated superior performance on these same cognitive tasks (e.g., Denmark, Czech Republic) (Borsch-Supan et al., 2005). Hence, based on the present results, it could be that further development of specific norms for the Israeli population is warranted.

Our findings regarding population group differences are inconsistent with our initial hypotheses and necessitate further study to better understand the results. Relative to veteran Jewish Israelis, Arab Israelis were less likely to have an impaired performance on the verbal recall task, and new immigrants from the former Soviet Union were significantly more likely to have an impaired performance on the verbal learning task. These results are surprising given past research that found higher levels of dementia among Arabs in Wadi Ara (Bowirrat et al., 2002). They are also unanticipated given the research that shows that the majority group in other societies usually outperforms on cognitive tasks relative to minority groups (Ng et al., 2007; Schwartz et al., 2004).

One explanation to account for the current findings is that the well-developed oral tradition among Arabs might have impacted their ability to recall a list of words in the present study. The new immigrants from the former Soviet Union, on the other hand, were uprooted from their country of origin more than a decade prior to the SHARE study. Thus, it is possible that at the time of evaluation, their verbal abilities in both their native language and the host

language were not fully adequate. This could well be why their performance on the verbal learning task was impaired. Further investigation of these hypotheses is recommended.

Another interesting result uncovered in this study is that relative to the veteran Jewish Israelis in the sample, the new immigrants from the former Soviet Union were more likely to report impaired reading ability. We should point out that the SHARE probe for the evaluation of reading and writing abilities asks about every day performance. Hence, it is quite possible that the new immigrant respondents reported on their perceived abilities to read Hebrew rather than their ability to read Russian, since Hebrew is the principal official language in which all Israelis must function. It is also important to note that, by definition, the new Soviet immigrants in the sample arrived in Israel in the early 90's or later. Most of them began to learn Hebrew only after their immigration, as adults. Clearly, commencement of language lessons late in life makes the acquisition of a new language more difficult. Finally, we should also note that reading ability is a subjective measure of cognitive functioning, rather than an objective one. Consequently, the responses among the new immigrants may actually represent a lower mental state due to post-immigration relocation stress. The use of cognitive interviews to further examine this particular finding is, thus, recommended.

Another interesting finding concerns the performance of the various groups on the arithmetic task. As noted, the performance of both veteran Jewish Israelis and Arab Israelis was quite comparable and was largely affected by their educational level—those with higher levels of education were less likely to exhibit impairment. This was not the case, however, for new immigrants from the former Soviet Union, whose performance was better than the performance of the other groups especially at lower educational level. One potential explanation for this particular outcome is that level of education in this study was determined by years of education. The number of years of schooling may not necessarily reflect the actual quality of mathematical training received. It is possible that in the former Soviet Union, even those with fewer years of schooling had been exposed to better mathematical training than was the case among veteran Jewish and Arab-Israelis.

Last, in support of the validity of our findings regarding population-group differences, the results further suggest that age and education are the best predictors of performance on the range of cognitive domains evaluated in the present study. This follows the trends reported in the literature elsewhere. In addition, the current findings confirm the presence of gender disparities in arithmetic in this Israeli sample, a trend that has emerged in other national settings as well.

A few limitations of the present inquiry need to be explicated. The use of performance level norms that were developed by SHARE headquarters in Europe may not be entirely appropriate for use in the Israeli sample. Despite this concern, we decided to apply the norms used by SHARE-Europe given the lack of alternative established criteria and in order to guarantee comparability. It is important to note that these measures and specific cut-off criteria were established with a cross-cultural comparison in mind.

An additional limitation of the present analysis is that the study was not able to take into account potential internal differences within the respective population groups. For example, we did not distinguish between Christian Arabs and Muslim Arabs or between Jews born in Europe and those born in Africa or Asia. It is possible that such differentiation might produce further clarifications and distinctions in regard to cognitive functioning. However, sample size did not allow for this level of analysis in all cases.

We should also point out that we did not specifically control for length of time in the country, as this criterion was already employed to define the group of new immigrants.

Thus, the population-group variable served as a proxy for duration of residence in Israel. Finally, it would have been informative to consider the contribution of genetic markers, such as ApoE 3, to level of cognitive function among the different population groups. This was not possible, however, since such information was not collected as part of the SHARE study.

Despite the limitations, this study has unique value. It is the first national sample to evaluate cognitive functioning of Israelis aged 50 and older, using a variety of cognitive screens specifically tailored for cross-cultural comparison. Moreover, the analysis uncovered several unexpected findings. New immigrants were more likely to report impaired reading ability. Arab Israelis were more likely to perform adequately on the recall tasks, and new immigrants were more likely to have impaired performance on the verbal learning task. The performance of new immigrants from the former Soviet Union on the arithmetic task was less affected by their level of education, relative to the performance of the other two population groups. These findings regarding disparities across population groups in relation to cognitive functioning need to be further explored using both qualitative and quantitative tools. The findings also suggest a need for further research to distinguish between oral tradition, years of education, and quality of education as determinants of cognitive functioning.

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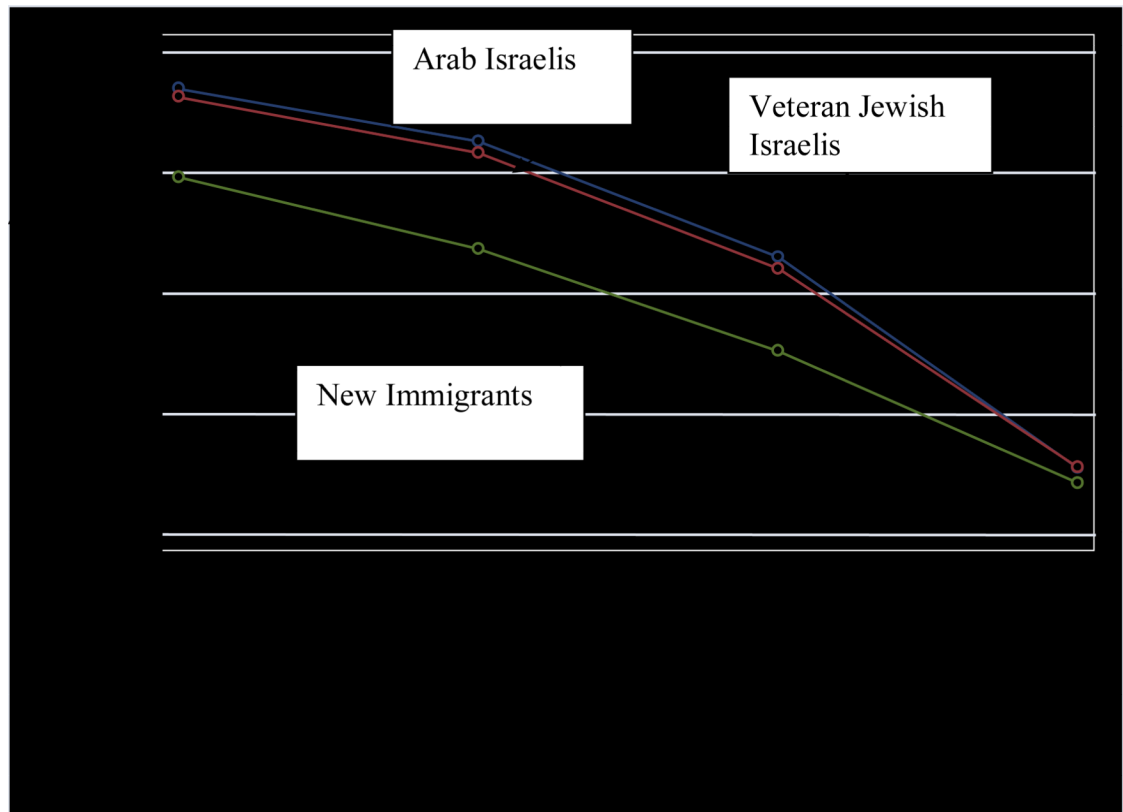


Figure 1. Population Group and Education as Predictors of Arithmetic Ability⁹
⁹ For Arithmetic, higher score represents greater likelihood of impairment. For education, higher score represents more years of education.

Table 1

Demographic Characteristics of the Sample by Population Groups

	Overall sample (2,492) ^f	Population Groups			Chi-Square
		Veterans (1974)	Arabs (331)	Immigrants (187)	
Gender					110.1 ^{**}
Female	1182 (54.9%)	1030 (55.6%)	31 (23.9%)	121 (66.3%)	
Age					16.0
50-59	1000 (44.1%)	793 (44.3%)	147 (50.2%)	60 (40.5%)	
60-69	788 (25.6%)	582 (24.9%)	129 (30.5%)	77 (26.3%)	
70+	704 (30.1%)	599 (30.7%)	55 (19.2%)	50 (30.1%)	
Education					680.3 ^{**}
Primary	627 (19.7%)	388 (18.8%)	237 (70.6%)	2 (.1%)	
Secondary	1244 (50.4%)	1112 (57.5%)	67 (21.6%)	65 (37.0%)	
Tertiary	614 (29.7%)	467 (23.6%)	27 (7.7%)	120 (62.8%)	
Income					251.8 ^{**}
Lower Quartile	616 (27.6%)	391 (24.0%)	157 (47.5%)	68 (32.4%)	
Second Quartile	628 (24.7%)	451 (20.0%)	112 (37.1%)	65 (37.0%)	
Third Quartile	626 (27.1%)	531 (29.1%)	53 (12.0%)	42 (26.3%)	
Fourth Quartile	622 (20.4%)	601 (26.8%)	9 (3.3%)	12 (4.2%)	
Ever Smoked					81.4 ^{**}
Yes	1021 (38.9%)	892 (44.4%)	82 (23.1%)	47 (25.5%)	

^f Results are reported as frequency (%).

^{**} indicates p<.01

Table 2

Multivariate Analyses of Population group as a Predictor of Reading and Writing Abilities, Controlling for Demographic Variables (n=2,492)

Group	Reading Ability ²		Writing Ability ³	
	OR	95% CI	OR	95% CI
Group				
Veterans (reference)	1		1	
Arabs	.87	.47-1.61	.89	.51-1.56
New Immigrants	2.47**	1.32-4.60	2.14	1.11-4.09
Gender				
Male (reference)	1		1	
Female	.78	.51-1.19	.80	.52-1.24
Age				
50-59 (reference)	1		1	
60-69	2.53**	1.52-4.20	1.95**	1.18-3.21
70+	4.21**	2.44-7.28	4.25**	2.43-7.43
Education				
Primary (reference)	1		1	
Secondary	.28**	.17-.46	.33**	.21-.53
Tertiary	.15**	.08-.27	.13**	.07-.24
Income				
Lower Quartile (reference)	1		1	
Second Quartile	1.36	.83-2.24	1.29	.77-2.15
Third Quartile	1.02	.54-1.91	.83	.43-1.58
Fourth Quartile	.83	.41-1.66	.65	.32-1.30
Ever Smoked				
No (reference)	1		1	
Yes	.80	.53-1.20	.88	.60-1.31

²Logistic regression was conducted to identify the role of population groups as predictors of reading ability controlling for demographic variables. $F(11,1661)=8.16, p<.001$

³Logistic regression was conducted to identify the role of population groups as predictors of writing ability controlling for demographic variables. $F(11,1660)=8.93, p<.001$

** indicates $p<.01$

Table 3

Multivariate Analyses of Population group as a Predictor of Orientation and Arithmetic, Controlling for Demographic Variables (n=2,492)

Group	Orientation ⁴		Arithmetic ⁵	
	OR	95% CI	OR	95% CI
Group				
Veterans (reference)	1		1	
Arabs	.71	.37-1.36	3.10	1.31-7.30
New Immigrants	.71	.29-1.76	20.63 ^{**}	3.62-117.49
Gender				
Male (reference)	1		1	
Female	1.08	.63-1.86	1.92 ^{**}	1.18-3.11
Age				
50-59 (reference)	1		1	
60-69	1.33	.78-2.27	1.53	.93-2.54
70+	3.56 ^{**}	1.83-6.91	1.62	.84-3.13
Education				
Primary (reference)	1		1	
Secondary	.29 ^{**}	.17-.48	1.09	.43-2.75
Tertiary	.08 ^{**}	.04-.16	.79	.43-7.37
Income				
Lower Quartile (reference)	1		1	
Second Quartile	.64	.36-1.11	2.02	1.14-3.59
Third Quartile	.74	.35-1.57	1.88	.98-3.57
Fourth Quartile	.25 ^{**}	.12-.49	1.33	.68-2.61
Ever Smoked				
No (reference)	1		1	
Yes	1.13	.70-1.80	.65	.41-1.03
Group*Education	--	--	.69 ^{**}	.58-.83

⁴Logistic regression was conducted to identify the role of population groups as predictors of orientation ability controlling for demographic variables $F(11,1666)=11.56, p<.001$

⁵Logistic regression was conducted to identify the role of population groups as predictors of arithmetic ability controlling for demographic variables $F(12, 1665)=6.21, p<.001$

^{**} indicates $p<.01$

Table 4

Multivariate Analyses of Population group as a Predictor of Verbal Learning and Verbal Recall, Controlling for Demographic Variables (n=2,492)

Group	Verbal Learning ⁶		Verbal Recall ⁷	
	OR	95% CI	OR	95% CI
Group				
Veterans (reference)	1		1	
Arabs	.44	.23-.84	.31**	.16-.60
New Immigrants	2.65**	1.38-5.07	1.23	.49-3.08
Gender				
Male (reference)	1		1	
Female	.70	.46-1.06	.63	.36-1.12
Age				
50-59 (reference)	1		1	
60-69	2.09**	1.30-3.37	2.06	1.05-4.02
70+	6.30**	3.62-10.98	6.02**	2.13-16.97
Education				
Primary (reference)	1		1	
Secondary	.34**	.20-.56	.43	.22-.83
Tertiary	.18**	.10-.34	.49	.22-1.05
Income				
Lower Quartile (reference)	1		1	
Second Quartile	.78	.46-1.33	.81	.43-1.49
Third Quartile	.71	.37-1.38	.40	.16-.97
Fourth Quartile	.88	.45-1.73	.71	.34-1.49
Ever Smoked				
No (reference)	1		1	
Yes	1.50	1.01-2.22	1.53	.87-2.69

⁶Logistic regression was conducted to identify the role of population groups as predictors of word learning ability controlling for demographic variables $F(11,1654)=8.51, p<.001$

⁷Logistic regression was conducted to identify the role of population groups as predictors of verbal recall ability controlling for demographic variables $F(11,1655)=3.64, p<.001$

** indicates $p<.01$

Table 5

Multivariate Analyses of Population group as a Predictor of Word Fluency, Controlling for Demographic Variables (n=2,492)

	Word Fluency ^δ	
	OR	95% CI
Group		
Veterans (reference)	1	
Arabs	1.21	.63-2.31
New Immigrants	1.63	.87-3.07
Gender		
Male (reference)		
Female	.91	.61-1.38
Age		
50-59 (reference)	1	
60-69	2.21**	1.33-3.38
70+	7.11**	3.83-13.20
Education		
Primary (reference)		
Secondary	.36**	.21-.62
Tertiary	.27**	.14-.51
Income		
Lower Quartile (reference)		
Second Quartile	1.17	.70-1.95
Third Quartile	.91	.46-1.79
Fourth Quartile	.99	.51-1.91
Ever Smoked		
No (reference)	1	
Yes	.72	.49-1.06

^δ Logistic regression was conducted to identify the role of population groups as predictors of word fluency ability controlling for demographic variables $F(11, 1650)=7.29, p<.001$

** indicates $p<.01$