Life Course Factors and Societal Structures in the Development of Cognitive Health Inequalities

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Background

Cognitive functioning and its change in old age is shaped by various factors which are differentially distributed across country settings, historical time points as well as population subgroups. Resources accumulated over the life time form important reserves to draw on in later life health. While the main focus of late life health inequalities has been on individual-level associations, the cumulative advantages/ disadvantages framework enables to position the developments of health inequalities within systemic forces of compounding life events and trajectories (Dannefer, 2003). Furthermore, these inequalities may multiply over cohorts and generations. Therefore, individual characteristics and trajectories in later life health outcomes interact with the wider organisation of social life. The role of the factors that are of collective or structural nature in later life health has been less studied, especially in various cultural contexts, and for cognitive functioning (Cheng et al., 2025).

Several Eastern European countries, including Estonia, provide a useful experiment-like context for exploring the markers of macro-level transformations in later life cognitive functioning. Multiple generations of people currently living in these contexts have experienced profound societal transitions over their lifetime. Moreover, different population groups within countries may have been differentially exposed to socio-political regulations, their changes, and implementation as well as to health risks in these circumstances (Dannefer, 2003) under state socialism.

Existing cross-national comparative studies report small or no differences in late life cognitive functioning between Central and Eastern Europe and other European countries (Ahrenfeldt et al. 2019; Sakkeus et al., 2023a). The *decline* in cognitive functioning may be slower in Central and Eastern Europe than among their counterparts in Northern and Western Europe (Wolfova et al. 2024). While disadvantages in accumulated socio-economic position over the life time is associated with worse cognition in later life at the total European level, it has not been more marked for Central and Eastern European region compared to the rest of Europe (Sakkeus et al., 2023a).

The improvement in late life cognitive functioning for women has been observed in several contexts recently, mainly explained by educational expansion in the first half of the 20th century (Angrisani et al., 2020; Leist et al., 2021). Greater benefits on late life cognition from lower educational inequalities may have been especially relevant for women with disadvantaged childhood backgrounds (Leist et al., 2021). The advantage in later life cognitive functioning among women than men has been more pronounced among older women in Eastern European countries, including Estonia, compared to other parts of Europe (Angrisani et al., 2020; Sakkeus et al., 2023a; Wolfova et al., 2024). The benefit towards women has been shown to start from the cohorts born in the 1940s onwards (Angrisani et al., 2020; Wolfova et al., 2024). The uniform legal obligations for acquiring certain education levels as well as the requirement for everyone to work under state socialism might explain some of these findings. Beyond education, generally more gender equal settings may benefit cognitive functioning, too (Angrisani et al., 2020).

Early-life as well as lifetime accumulated socio-economic position are relevant for migrant origin population groups as accumulated disadvantages over various life periods indicate faster cognitive decline (Haan et al., 2011). High cultural and financial capitals in later life are positively associated

with memory, overriding low childhood SES and residence country effects (Peterson et al., 2021). However, no intersectional effects by race and ethnicity have been reported by some authors (Kobayashi et al., 2024).

This article explores whether and how inequalities in childhood and adulthood socio-economic positions may manifest in later life cognition outcomes in a setting where the institutional context has been broadly similar for different sub-groups over the recent decades. In addition to specifying cohort and gender differences in cognition, we contribute to the literature on health and migration by analysing how cognitive functioning changes in later life depend on the differential distribution of life time socio-economic positions between migrants and non-migrants in Estonia. While the institutional setting was similar for both population groups throughout much of their (adult) life, the country-level settings and transformations created different opportunities and inequalities by sub-groups, as measured by two distinct cohorts here. To our knowledge, this is the first study that studies later life cognition comparing groups for whom the macro-level preferential positions have changed across life and with social transition.

We expect everyone to experience declines in cognitive functioning over time, as expressed in the within-effect findings. However, adulthood SEP is expected to ameliorate these effects, especially among migrant men and women.

Data and methods

We use longitudinal SHARE Estonia data collected in Waves 4-9 (2010 – 2022). We include people aged 50 and above who also participated at least in Wave 5 when childhood and adulthood socio-economic indicators were measured (analytical sample N=3,006).

The dependent variable is verbal recall which is measured by summing immediate and delayed recall items, creating a continuous score ranging between 0 – 20. To distinguish the effects of social change, respondents were grouped into belonging either to the older (born 1930-49) or younger cohort (born 1950-69). This choice reflects differential socialization contexts for different origin groups. Migrant origin is defined based on country of birth, distinguishing foreign-born and those born in the country.

The socio-economic positions (SEP) in childhood and adulthood were the main independent variables, constructed based on information collected from responses in SHARE Wave 5. Childhood SEP was based on the following single variables: the number of books owned in childhood home, the number of rooms per capita in the parental home, the highest level of education of the parents, and the financial position of the family at age 15. Adulthood SEP was constructed from the following items: the respondent's highest educational level achieved, the occupational skill level of the last (pre-retirement) job, current household income and current household wealth. Household income and wealth were adjusted for household size using the square root method. The standardised SEP indices were generated to reflect a scale from 0 to 1 (Niedzwiedz et al., 2014; Sakkeus et al. 2023b).

Age at the time of the interview, having or developing everyday activity limitations and partnership status at the time of each interview wave were included as time-varying. Number of children ever had reflects potential support sources and people to communicate with to stimulate cognitive functioning.

Longitudinal data of cognition change was analysed to estimate the effects of social change, considering lifetime socio-economic positions by cohort, gender and origin. Level-one units were

person-time observations, and the level-two units were individuals. We used the correlated random effects (CRE) model of the *xthybrid* package in Stata (Schunck & Perales, 2017) to estimate different effects, including also time-varying information. This model allows estimating both fixed- and random-effects components of change over time, combining the strengths of fixed- and random-effects approaches. CRE models account fully for unobserved heterogeneity by including group-averaged fixed effects for the observed period of time (Schunck & Perales, 2017).

Preliminary results

There were more people in the older, 1930-49 birth cohort among the foreign-born group (71.1%) than natives (62.4%), and the mean age of respondents was somewhat higher for migrants. The mean verbal recall at baseline was significantly higher among the native than the foreign-born group in case of both birth cohorts. The verbal recall score is normally distributed, with a minimal left skewness (see Fig.1). The mean verbal recall at baseline was higher among women than men in all subgroups by cohort and origin; the gender differences were not statistically significant only for migrants born in 1930-49.

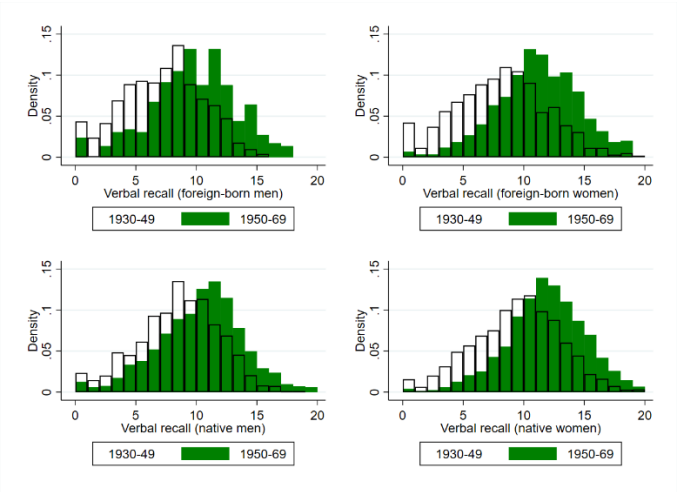

Figure 1. Distribution of the mean verbal recall over waves by birth cohort, origin and gender. Source: SHARE Estonia, Waves 4-9 (2010 – 2022), N=3,006.

We confirm previous results for Eastern European settings (Angrisani et al., 2020; Sakkeus et al., 2023a; Wolfova et al., 2024) that women in Estonia have better cognitive functioning levels than men at baseline. However, women also experience greater variation in cognitive functioning decline over time. For both migrant and native women, accumulated adulthood socio-economic position was the most important factor reducing the negative within-effects or change in cognitive functioning over time, based on the panel analysis.

Given that migrants were born and grew up outside of independent Estonia where the Soviet forces and state socialism were in place earlier, our expectation regarding the somewhat worse childhood socio-economic position among migrants was confirmed, especially for the 1930-49 cohort. However, also adulthood SEP was on average lower for migrants, for this cohort. Having a higher childhood SEP as well as a higher adulthood SEP score was associated with positive cognitive functioning change for everyone, but only the role of childhood SEP appeared clearly to shape the (positive) outcomes of migrant men. Childhood SEP appeared more relevant for migrant than native men in Estonia which is probably related to the larger diversity in the backgrounds of the former group, but also to the worse childhood SEP among the observed generations of migrants on average.

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