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**Exploring Predictors of Cognitive Reserve and Cognitive Performance
in Slovenia and North Macedonia:
The Effects of Survival versus Self-expression Values**

Relatrice: Prof.ssa Sara Mondini

Laureanda: Mia Micevska

Matricola: 2023863

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ABSTRACT

Cognitive reserve is defined as a mechanism that compensates for age or pathology induced brain changes and helps in maintaining healthy cognitive functioning. Knowing that cognitive reserve is built by everyday life activities which altogether aggregate with age (e.g., education, work engagement, leisure activities), it is important to consider the cultural value system that contributes to shaping and prioritising said activities. The same principles are also thought to be reflected by the cognitive performance of individuals living in a certain cultural unit. The present study examines a subset of cultural values, within two countries, Slovenia and North Macedonia. Survival values place emphasis on economic/physical security and low outgroup trust (typically found in developing countries, like North Macedonia), while self-expression values prioritise environmental protection, equality, well-being, and quality of life (characteristic of developed countries, like Slovenia). Taking the above into consideration, we explored whether prioritisation of survival versus self-expression values can be a predictor of cognitive reserve and cognitive performance in healthy older adults in Slovenia and North Macedonia. We also considered the effect of cognitive reserve on cognitive performance in both samples. Results showed that cultural values did not play a significant role in explaining cognitive reserve but did have a positive predictive value on cognitive performance when paired with years of schooling in the sample from North Macedonia. Perhaps due to a small sample size and use of self-administered computerised instruments, cognitive reserve did not have an effect on cognitive performance in either of the samples.

INTRODUCTION

We are living in a world where the ageing population is growing rapidly, especially in Europe. In 2019, individuals aged 55 years or more used to take a little over one third (33.6%) of the total population in the European Union, however by 2050 this number is projected to increase and reach 40.6% (and 45.9% in Italy for example) (European Commission. Statistical Office of the European Union., 2020).

On the one hand, physical signs of ageing are natural, visible, and expected. However, on the other hand, cognitive decline in older age can be manifested in various ways like slower processing speed, problems in executive functioning and/or short-term memory decline (Bisiacchi et al., 2008; Paraskevoudi et al., 2018). These changes can be accounted for by both neurodegenerative processes due to healthy ageing and neuropathological disease, such as Alzheimer's disease and numerous types of dementias. Moreover, vascular disease and complex genetic factors are often an underlying cause of cognitive decline (Cabeza et al., 2018; Chapko et al., 2018; Kim et al., 2021).

Nevertheless, symptoms and time of onset of cognitive decline differ greatly among individuals, even within a pathology-matched sample (Kivipelto et al., 2020; Qiu et al., 2009; Satz et al., 2011; Steffener & Stern, 2012). As developed by Stern and colleagues (Stern, 2002, 2009; Stern et al., 2019) this variability can be explained by the concept of cognitive reserve, known as the brain's flexibility, resilience, and ability to sustain more damage without showing significant difficulties in normal functioning. Studies have also confirmed that higher cognitive reserve is correlated to better cognitive performance on neuropsychological tests (Mondini et al., 2016; Singh-Manoux et al., 2011; Stern et al., 2019). During one's lifespan, the brain's anatomy changes (gets richer in synapses) due to experiences like education, occupational status and leisure time activities involving sports, socialising or intellectual engagement (Chapko et al., 2018; Lenart-Bugla et al., 2022; Stern, 2009).

Knowing that cognitive reserve reflects the activities of everyday life, which altogether aggregate with age, we need to consider that these activities do not play out in a vacuum. Each individual belongs to a cultural model with relatively clear value systems (Dressler, 2020; Dressler & Bindon, 2000; Hofstede, 2011) that guide daily actions, prioritise some

behaviours over other, shape distinct cognitive maps and guide interactions with the environment (Hruschka et al., 2005; Quesque et al., 2020; Rosselli et al., 2022) .

Following recent methodological guidelines for culture-comparative research (Fischer & Poortinga, 2018) and aiming to improve upon outdated approaches toward national culture (Baskerville, 2003), the present study examines a subset of cultural values within two countries, Slovenia and North Macedonia. There is full acknowledgement that cultural values do not perfectly overlap with geographical borders (Taras et al., 2009, 2016), or other arbitrary culture-grouping methods like for example language, race, or ethnicity (Ardila, 2020; Manly & Echemendia, 2007; Rosselli et al., 2022). In that sense, the current research considers cultural values as one part of a multidimensional complex system (e.g., culture–gene coevolutionary theory discussed in Chiao et al., 2010; Mrazek et al., 2013; and Chart 1 by Smith & Bond, 2022), and not as the only building blocks of culture.

Unlike cultural values, political, social, and economic institutions settle neatly inside borders. According to Tabellini (2010), culture is endogenous to economic development and as stressed by the modernization theory, economic development and political freedom have predictable effects on culture and social life (Inglehart & Baker, 2000). One of the most large-scale attempts to measure these effects was done by the Values Surveys¹, from which Inglehart and Welzel (2005) constructed the scale Survival versus Self-expression Values (SSEV). Namely, survival places emphasis on economic/physical security and low outgroup trust (typically found in developing countries, like North Macedonia), while self-expression prioritises environmental protection, equality, well-being, and quality of life (characteristic of developed countries, like Slovenia).

Taking all the above into consideration, we are going to explore whether prioritisation of certain values, measured by a score on SSEV items, can explain the variance in cognitive reserve and cognitive performance in healthy older adults from Slovenia and North Macedonia. We assume that individuals emphasising self-expression values would exhibit higher CRIq and Auto-GEMS scores, particularly in Slovenia where such values are predominant. Conversely, prioritisation of survival values, prevalent in developing

¹ The European Value Study (EVS) and the World Value Survey (WVS) are two open-source, cross-national, and repeated cross-sectional survey research programs. The joint EVS-WVS time-series data covers a 40-years period (1981-2021) and includes 450 surveys from 115 countries/territories (EVS, 2021; Haerpfer et al., 2021).

nations like North Macedonia, was anticipated to yield contrasting outcomes. Furthermore, drawing from existing literature demonstrating the favourable association between cognitive reserve and cognitive performance (Mondini et al., 2022; Nogueira et al., 2022; Nucci et al., 2012; Stern et al., 2019), this research also investigated this hypothesis across each sample subgroup.

1. COGNITIVE RESERVE

1.1. Defining Brain Reserve, Brain Maintenance and Cognitive Reserve

In 2019 a National Institutes of Health (NIH) supported collaboratory was formed to establish Research Definitions for Cognitive Reserve and Resilience, aimed to provide unified understanding of brain reserve, cognitive reserve, brain maintenance, and other related terms. Chaired by Yaakov Stern, the workgroup published an updated framework, which is going to be used in this chapter, as it contains expert-approved, operational definitions based on systematically summarised research.

Brain reserve refers to the quantity of neural substrate in the brain, meaning the number of synapses, neurons or brain volume measured at any given time. In practical terms, larger brains, or brains with higher neuronal count, can undertake more deterioration (e.g., amyloid plaques) or injury (e.g., lesions) before clinical symptoms become visible. Therefore, individual differences in brain capacity determine the crucial threshold of loss, under which overt impairments can no longer stay undetected (Reserve and Resilience Collaboratory, 2022). Hence, when more neural substrate is available, brain reserve can aid normal functioning by compensating for damaged brain areas (Steffener & Stern, 2012; Stern et al., 2019).

When it comes to the exact techniques and methods used in brain reserve research, a study by Christensen et al. (2007) summarises the following: brain volume, white matter hyperintensity, intracranial volume, and cerebrospinal fluid volume; all obtained by using MRI data, in addition to diffusion tensor imaging methods for white matter hyperintensity specifically. Newer methods stemming from nuclear medicine neuroimaging advancements provided grounds for development of radiopharmaceuticals like tau protein and amyloid tracers (increased levels of these proteins indicate brain burden and are found in Alzheimer's disease patients; hence individuals with greater brain reserve are expected to have advanced pathology, but relatively stable cognitive functioning) in addition to PET and single photon emission tomography studies of cerebral blood flow and cerebral glucose metabolism (similar hypothesis as above, low glucose metabolism is linked to increased clinical severity in dementia) (Giovacchini et al., 2019). Moreover, it is crucial

to clarify that brain reserve is a passive neuroanatomical concept and does not encompass active changes, adaptations, or acute reorganisation of neural networks.

Brain maintenance, however, leaves room for partial influence over this passive model (Satz et al., 2011; Stern, 2009; Stern et al., 2019). It represents a complex function of genetics, environment and life experiences allowing, for some individuals, above average preservation of brain chemistry, structure and function in old age (Nyberg et al., 2012; Reserve and Resilience Collaboratory, 2022). For example, some rather fixed individual differences are low amyloid deposition (contributes to intact cognitive stability well into the eight decade) and genetic brain-derived neurotrophic (BDNF) polymorphism (facilitates plasticity in high-demand task) (Nyberg et al., 2012). In contrast, education (linked to total brain volume) (Foubert-Samier et al., 2012), spatial navigation training (Giovacchini et al., 2019) and low average alcohol consumption over 30 years (Anatürk et al., 2021) (both correlated to white matter integrity) are all potentially modifiable factors connected to both brain maintenance and brain reserve.

Cognitive reserve, on the other hand, is an active model, defined by the NIH framework as “a property of the brain that allows for cognitive performance that is better than expected given the degree of life-course related brain changes and brain injury or disease” (Reserve and Resilience Collaboratory, 2022, p. 3). It refers to the plasticity and flexibility of cognitive networks, complemented by cellular and molecular processes, which aid in effective use of available brain reserve to cope with disease related, or age-induced, cognitive decline (Stern, 2002; Stern et al., 2019). In addition to its wide application value in healthy ageing, cognitive reserve has been extensively researched in terms of its moderating role between dementia-type brain pathology and manifestation of clinical symptoms. Namely, neuropathology is thought to progress at a stable rate, regardless of cognitive reserve. Yet, individuals with higher levels of cognitive reserve require more severe levels of brain pathology before experiencing noticeable decline in cognition. Consequently, by the time symptom severity reaches criteria for dementia diagnosis (or mild cognitive impairment), individuals with high cognitive reserve will have steep pathology progression, compared to individuals with low cognitive reserve (Barulli & Stern, 2013; Franzmeier et al., 2017).

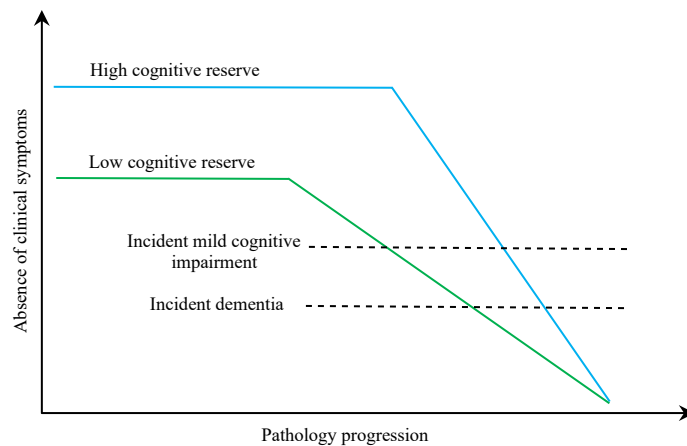


Figure 1. Representation of how cognitive reserve may mediate between dementia-related pathology and its clinical expression.

In terms of what causes some individuals to have higher (or lower) cognitive reserve, education, occupation, and leisure activities have been three most researched life course determinants of the active reserve model (Chapko et al., 2018; Lenart-Bugla et al., 2022; Satz et al., 2011; Stern, 2002, 2009). However, there are numerous factors contributing to cognitive reserve, at different age points, different levels pathology and different lifestyles, all yielding variable, unique outcomes. This is going to be extensively discussed in chapter 1.3, as it is highly important for the present study and requires further explanation.

Therefore, to summarise, the passive model suggests that the quantity of available neural substrate is what contributes to resilience, whereas the active model emphasises the possibility of actively utilising that neural substrate by increasing plasticity and developing strategies for information processing efficacy (Stern, 2009; Xu et al., 2015). Brain maintenance lies somewhere in the middle and serves as a complementary concept that helps explain the individual variability in preserved brain integrity and optimal functionality from adulthood into older age (Cabeza et al., 2018; Nyberg et al., 2012).

1.2. Neural Basis of Cognitive Reserve

There is much debate about the neural mechanisms that underline cognitive reserve. To provide some structure in the vast field of methods and hypotheses, two mechanisms have been identified: neural reserve and neural compensation. On the one hand, neural reserve suggests that there is variability among individuals in primary brain networks or cognitive

paradigms that underlie task performance. These networks can be activated to cope with increased task demand in healthy individuals and in patients with brain pathology.

On the other hand, neural compensation involves the use of alternate brain structures/networks mainly to compensate for brain damage or neurodegenerative diseases. These alternate networks may not normally be engaged in specific task performance but can be recruited when primary networks reach capacity or demands exceed a certain level (Stern, 2006, 2009). Considering both neural reserve and neural compensation, there are four potential ways that cognitive reserve could operate on a neurological level (Steffener & Stern, 2012).

Firstly, increased cognitive reserve is found to modulate or reduce the impact of age or AD-related pathology on performance or clinical outcome. Various studies on brain network architecture and functional connectivity have found that there is an inverse relationship between two brain networks: the default mode network and the dorsal attention network. This inverse relationship, called an "anti-correlation," has been linked to better cognitive control and working memory performance. To be exact, low levels of anti-correlation between the two networks are common in mild cognitive impairment, whereas high levels of anti-correlation are found in healthy adults (Gaubert et al., 2019; Lim et al., 2014). However, cognitive reserve proxies such as education and IQ may have a protective effect on memory in preclinical dementia cases, possibly by influencing the relationship between the networks' anti-correlation and memory. These results support the cognitive reserve hypothesis, which suggests that individuals with higher levels of education and IQ may be able to better maintain cognitive function despite brain changes (Franzmeier et al., 2017; Serra et al., 2015).

Secondly, cognitive reserve may directly improve task performance or clinical outcomes in a manner that is unrelated to task-related activation. Conducting an fMRI study, Stern and colleagues (2008), found that young subjects expressed a pattern of regional activations as a function of cognitive reserve during both high-demand and low-demand cognitive tasks, independent of task accuracy. However, this trend was only partially true for elderly subjects, as their activation patterns resembled the young only in low-demand tasks (no connection was found between cognitive reserve and pattern expression in the high-demand task, hence alluding to possible connectivity reorganisation and utilisation of alternative neural pathways among the elderly, as a result of ageing). These findings

were the basis for the later identification of a “task-invariant” cognitive reserve network of regional brain activity (Stern et al., 2018). Results showed a common activation pattern that occurred during 12 distinct cognitive tasks and was correlated with a measure of intelligence (IQ) that is often used as a proxy for cognitive reserve. Though, as the authors caution, the patterns of positive and negative regional brain activations linked to high cognitive reserve were determined by the specific proxies used in the study. Hence, different cognitive reserve proxies are expected to uncover unique patterns of neural activation that might provide additional neuroimaging evidence of the active reserve model.

Thirdly, cognitive reserve might enhance the efficiency and capacity of primary brain networks during task-related activation. For example, if primary network efficiency is maintained despite volume loss, it can still sustain function and result in satisfactory task performance (Barulli & Stern, 2013). Namely, elderly participants that showed grey matter volume loss, but had higher scores on a cognitive reserve proxy (IQ and education), maintained adequate cognitive performance. Such results might suggest that individuals with higher cognitive reserve initially have more efficient primary networks, and thus tolerate advanced atrophy without the need to use secondary networks (Steffener et al., 2011).

Lastly, in case of using compensatory (secondary) brain networks, cognitive reserve might moderate their negative effect on task performance by increasing their efficiency. The above mentioned study by Steffener and colleagues (2011), also found that higher levels of cognitive reserve among older adults lessened the negative consequences on task performance, usually associated with using a secondary brain network. This indicates that individuals with a higher IQ and educational attainment may successfully utilise compensatory networks and uphold optimal function.

Furthermore, evidence for neural underlining of the cognitive reserve model is found in studies of neurodegenerative diseases, rehabilitation, and cognitive training. Primarily, after the onset of clinical symptoms, individuals with higher cognitive reserve have shorter life expectancy and more advanced neurodegenerative disease progression, when compared to individuals with low cognitive reserve matched for the level of expressed clinical severity (Stern & Barulli, 2019). Consequently, patients with similar clinical symptoms, but with lower cognitive reserve, were the ones benefiting the most from

cognitive training programs, as opposed to patients with high cognitive reserve. Therefore, findings suggest that compensatory neural mechanisms of cognitive reserve moderated improvements in rehabilitation since neurodegenerative processes had slower progression in the group of patients with lower cognitive reserve, allowing better neural plasticity (Mondini et al., 2016).

1.3. Determinants of Cognitive Reserve and Cognitive Performance

Cognitive reserve can be enhanced through interventions and remains adaptable throughout life (Stern, 2012). The factors most frequently studied for their influence on cognitive reserve include education, occupation, and leisure activities. In more recent times, the concept cognitive reserve has expanded to encompass factors such as literacy levels and engagement in complex cognitive activities. These two variables play an active role in shaping cognitive reserve as they continue to evolve throughout one's life, even beyond the completion of formal education (Nogueira et al., 2022). However, there is no consensus regarding which determinants play a more significant role in promoting greater cognitive reserve or to what extent specific indicators of cognitive reserve can be modified over the course of one's life. For instance, a systematic review conducted by Chapko et al. (2018) revealed consistent evidence supporting the protective effect of education on overall cognitive abilities when faced with various measures of brain burden. On the other hand, the analysis of occupation as a potential determinant of cognitive reserve yielded inconclusive results.

Earlier investigations proposed that the acquisition of education might enhance cognitive reserve through alterations in dendritic and synaptic complexity or broader brain plasticity. Numerous studies have showcased the impact of education on cognitive reserve, predominantly in White populations or diverse samples where race/ethnicity is regarded as a potential confounding variable. However, these studies have overlooked the examination of racial/ethnic disparities in the quality of education (Avila et al., 2021).

Generally, individuals with elevated premorbid intelligence quotient (IQ), advanced educational attainment, active participation in leisure activities, and involvement in intellectually demanding professional pursuits exhibit diminished rates of cognitive decline and a diminished susceptibility to develop symptoms of dementia. The

individual's cognitive reserve, as measured by these factors, is intricately linked to the preservation of cognitive well-being and the adoption of a dynamic lifestyle during the ageing process. The robust correlation underscores the significance of cognitive reserve as a protective mechanism against the deleterious effects of neurodegenerative conditions and emphasises the relevance of sustained cognitive engagement throughout the lifespan for the maintenance of cognitive health (Nogueira et al., 2022). In other words, cognitive reserve reduces the early manifestation of clinical cognitive symptoms in instances of brain pathology, requiring a heightened pathological burden to elicit equivalent dementia symptoms in individuals possessing higher cognitive reserve levels (Mondini et al., 2016).

Moreover, in a detailed investigation using high-density EEG, Fleck et al. (2019) identified distinct variations in functional brain connectivity associated with cognitive and social factors, contributing to the concept of cognitive reserve in healthy adults aged 35 to 75 years. Namely, elevated cognitive reserve levels were linked to increased eyes-closed, long-range connectivity in low alpha frequencies in the occipital region. Additionally, high-cognitive reserve male participants exhibited heightened eyes-closed, local connectivity in delta frequencies. Conversely, heightened social cognitive reserve levels were correlated with increased local and long-range connectivity in both theta and low alpha frequencies, observed in both eyes-open and eyes-closed recording conditions. Furthermore, social factors contributing to cognitive health were examined in a systematic review by Lenart-Bugla et al. (2022), encompassing randomised controlled trials, longitudinal, and twin studies on healthy older adults. Social activity, social support, and larger social networks consistently correlated with improved global cognition and increased brain volume. These findings reinforced the significance of higher social engagement as a predictor for maintaining satisfactory cognitive function through various physiological, psychological, and behavioural pathways or experiencing only minor decline in later adulthood. Conversely, loneliness was negatively correlated with cognitive functions, particularly in domains such as general cognitive ability, intelligence quotient, processing speed, immediate recall, and delayed recall. Although greater social support and contact were linked to some protection against cognitive decline and dementia, the results were not entirely consistent. The review underscored

the need for further exploration of social interactions in comparison to lifestyle and physical health factors in understanding cognitive impairment.

Despite its significant role in cognitive functioning, quantifying cognitive reserve objectively poses a considerable challenge in the field. This difficulty primarily stems from the intricate nature of the cognitive reserve construct, making operationalization a complex task (Reserve and Resilience Collaboratory, 2022). Ideally, a cognitive reserve measure should incorporate a variable representing the moderation of the relationship between life course-related brain changes and cognitive changes. The precision of cognitive reserve measurement is enhanced when additional measures are considered: a) assessments of anatomic changes (e.g., brain-imaging analysis); b) evaluations of cognition (e.g., cognitive performance and daily functioning); and c) a cognitive reserve proxy, indicating the variable influencing the relationship between a) and c). Methods for assessing cognitive reserve range from instruments utilising a single proxy, often education (Chapko et al., 2018), to tools involving multiple proxies either aggregated into a total score or developed into latent variable models (typically through principal component analysis or structural equation modelling). Relying on a single proxy is likely to overlook crucial components of the complex cognitive reserve construct. Therefore, utilising questionnaires that encompass multiple components appears to be the standard approach for standardising cognitive reserve assessments.

Following the above criteria, a 2022 review by Nogueira et al., isolated 25 out of 579 studies which used a quantitative measure for cognitive reserve and concluded that the Cognitive Reserve Index questionnaire (CRIq; Nucci et al., 2012) was the most frequently used measure. It is followed by the Cognitive Reserve Questionnaire (CRQ; Rami et al., 2011), and the Lifetime of Experiences Questionnaire (LEQ; Valenzuela & Sachdev, 2007). As modern research is moving towards digitising some neuropsychological tools, please find more details in chapter 4.2 about the computerised version of the CRIq used in this study.

2. CULTURE, VALUES, AND COGNITION

2.1. Comparing Slovenia and North Macedonia: Historical, Political, and Socioeconomic Context

In the years between 1945 and 1991, Slovenia and Macedonia (North Macedonia since 2018²) were both part of the socialist federative republic of Yugoslavia (the remaining 4 republics comprising Yugoslavia were Bosnia and Herzegovina, Montenegro, Croatia, and Serbia, along with 2 autonomous regions Kosovo and Vojvodina). The heterogeneity of the federative republic formulated a unique political and socioeconomic model. It was considered one republic with 4 languages (Serbian, Croatian, Slovenian and Macedonian), 3 religions (Christian Orthodox, Roman Catholic and Muslim) and 2 alphabets (Cyrillic and Latin). However, what made it truly unique, were the capital aid and redistribution efforts to integrate high-middle-income (Slovenia), middle-income (Croatia and Vojvodina) and lower-middle-income regions (Serbia), with backward regions (Bosnia-Herzegovina, Macedonia, Montenegro and Kosovo) (Kukic, 2017)³. For reference about the GDP per capita of the Yugoslav regions compared to GDP per capita of Western European countries (Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden, Switzerland, and the United Kingdom) please see Figure 2.

Macedonia and Montenegro received federal aid (through the Federal Fund created in 1965 for the purpose of battling regional inequality) adding up to approximately 20 percent of gross investment. These numbers were kept in statistical records, however, outside of precise bookkeeping, capital shifted through the federal investment fund directly to firms in need even before 1965.

The socialist ideology of equalising the federative republics through relocation of income from more developed regions (e.g., Slovenia) to less developed regions (e.g., Macedonia) led to certain improvements in the educational front and non-agricultural sector, the two

² In this chapter, the name Macedonia will be used when presenting events, facts and figures relevant before the year 2018, as it was found in referenced literature. However, recent information will be presented using the name North Macedonia as found in all cited sources dating past 2018.

³ Please note that this income classification was valid during Yugoslavia's creation. Updated income figures and details regarding Slovenian and North Macedonian economy are going to be presented in continuation.

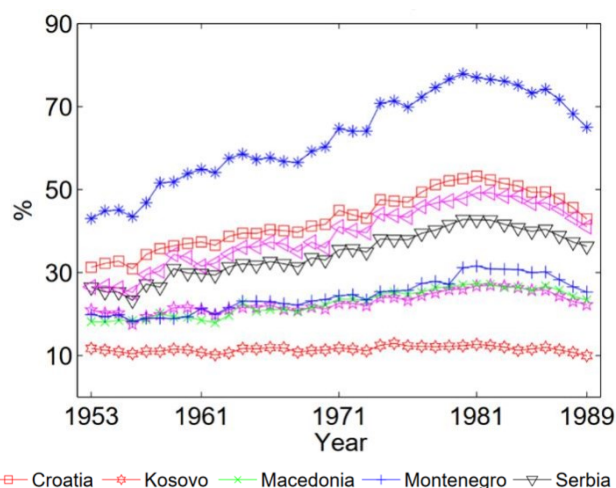


Figure 2. GDP per capita of Yugoslav regions relative to the GDP per capita of the Western European core in %, 1953-89. Figure adapted from Kukic (2017) containing data from Bolt and van Zanden (2014).

being tightly connected. In Figure 3 it is visible that Macedonia's non-agricultural labour had a steady climb throughout the years, slowly minimalizing the gap with Slovenia by 1986. Simultaneously, as depicted in Figure 4, aggregated average years of schooling were also on the rise in all republics, practically converging in 1986 (Kukic, 2017). Slovenia had considerable economic advantage and stability even before entering the federation. Along with Serbia and Croatia, it was one of three republics that had an established university before becoming part of Yugoslavia. During the post-war recuperations, in 1949 universities were also founded in Macedonia and Bosnia and Herzegovina. Although there were great discrepancies, the Federal Ministry of Education was responsible for global educational planning and organisation of relevant higher education institutions in the entire Yugoslavian federation.

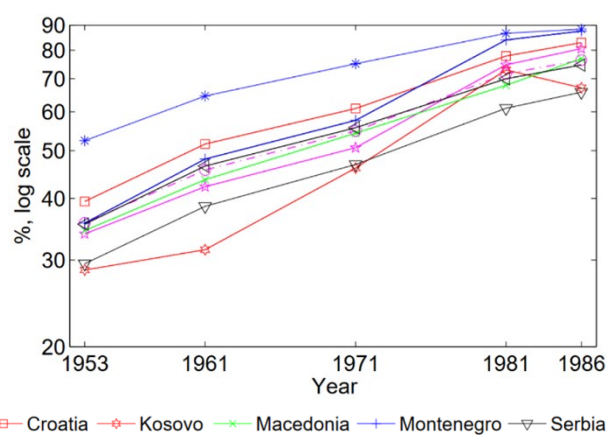


Figure 3. Percentage of non-agricultural labour in total labour. The figure was adapted from Kukic (2017).

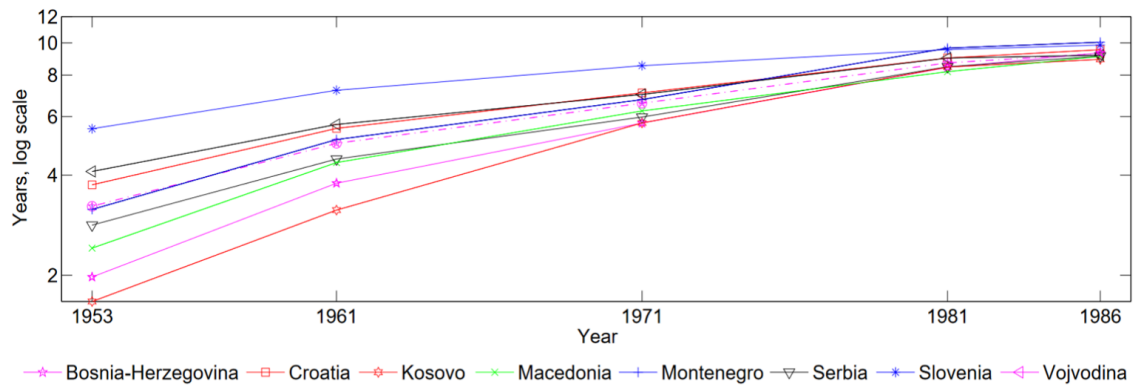


Figure 4. Aggregate average years of schooling. The figure was adapted from Kukic (2017).

After 1974, the republics gained certain autonomy regarding organisation of their schooling system, nevertheless higher education standards and contents remained fairly unified and held a classic three-degree structure (Bachelors, Masters and PhD degree) (Šoljan, 1991).

This pre-independence period is highly important for the current research, as the above-discussed evidence helped in determining an age limit that fits both Slovenian and North Macedonian participants. In both countries, adults that are now between 55 and 65 years of age, were born between 1957 and 1967 as citizens of Yugoslavia. These individuals stepped into adulthood and turned 18 between 1975 and 1985. During that time, the gap between Slovenia and Macedonia was shrinking. The countries were, in those 10 years, relatively comparable in terms of years of schooling, higher education opportunities and development of the non-agricultural sector (see Figures 3 and 4). Moreover, it was a stable period of peace and prosperity taking place more than a decade after World War II, and just before the political and socio-economic stirring of independence movements in the late 1980s.

The events that accompanied Yugoslavia's disintegration were dense with conflict. A 10-day long war between the armies of Slovenia and Yugoslavia erupted when the country proclaimed independence in 1991. Shortly after, Macedonia left the federation without armed opposition. However, the region was far from stable. Bosnia and Herzegovina and Croatia were at war until 1995, followed by a devastating armed clash between Serbia and Kosovo in 1998, which culminated with a NATO intervention in late 1999. As a result, Kosovar refugee camps were established in Albania and Macedonia. Unfortunately, this situation gave passage to an ethnic Albanian minority whose extremist

militant group incited an armed conflict with the national army on the territory of north-west Macedonia in 2001 (Zgaga, 2011).

From that point onward, the two countries, Slovenia and Macedonia, took diametrically different paths that were no longer hidden by a veil of socialist ideology, equality and redistribution. Slovenia had a smooth post-independence transition and allocated all efforts in modernization and European integration, gaining EU membership in 2004. At the same time Macedonia struggled to recuperate from the armed conflict and the political changes that had to be made in order to sustain a democratic and inclusive government. Despite the long transitional period and continuous reforms to fortify the market economy (as opposed to planned economy) and modernise the higher education system, North Macedonia has one of the highest percentages of persons at risk of poverty and social exclusion (30.9% in 2020) in the European region. As a comparison, these numbers are twice as low in Slovenia (14.9% in 2020), as the country sustains stable socio-economic growth (see Figure 5) (EuroStat, 2022). The EuroStat database also provides statistics by age class, showing that the percentage of persons at risk of poverty and social exclusion aged between 55 and 64 (comparable to the age range of the participants in the current study, 55 to 65) is 34.3% in North Macedonia and 18.3% in Slovenia in the year 2020. To better grasp the historical contrast, see GDP per capita of Yugoslav regions compared to countries of Western Europe presented in Figure 2.

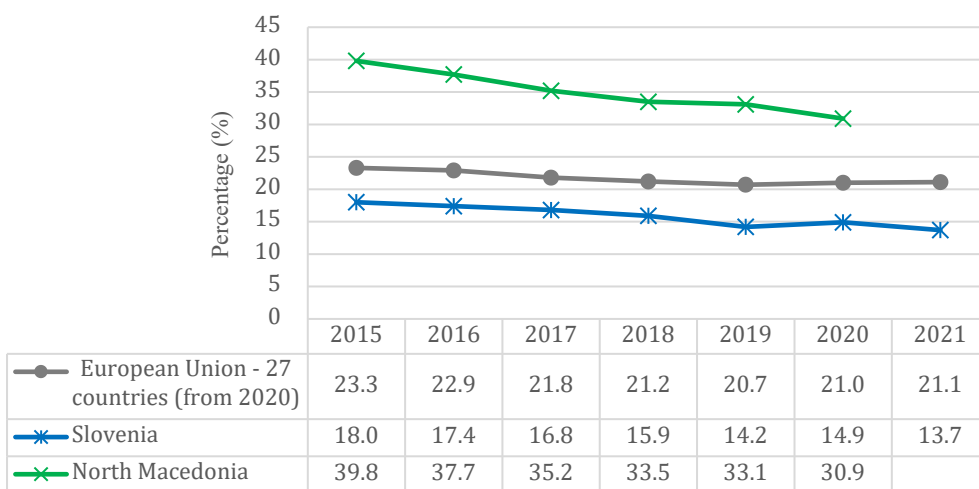


Figure 5. Percentage of persons at risk of poverty or social exclusion, age class 18 and over (EuroStat, 2022).

It is clear to conclude that after the independence, the dynamic remained the same, as it is visible in Figure 6. Slovenia kept up with the standards of the European Union countries, while North Macedonia remained on the lowest end of annual earnings. Furthermore, according to the Freedom in the World⁴ annual global report on political rights and civil liberties (Freedom House, 2022), Slovenia has a global score of 90/100 and it is ranked as free, while North Macedonia's score is 67/100 and it is ranked as partly free. Moreover, this trend is reflected in the Corruption Perception Index ⁵(CPI; Transparency International, 2021), which ranges from 0 – 100, meaning from highly corrupt to very clean, respectively. Latest data of 2021 shows that Slovenia's CPI is 57/100, while North Macedonia's index is 39/100. For the aim of drawing a historical parallel between the initially mentioned country development indicators (non-agricultural labour in Figure 3 and years of schooling in Figure 4) pre and post Yugoslavia, recent data is going to be drawn from the Human Development Reports (United Nations, 2022). Therefore, aggregated years of schooling in 2021 for Slovenia averaged to 12.8 years, and 10.2 years for North Macedonia.

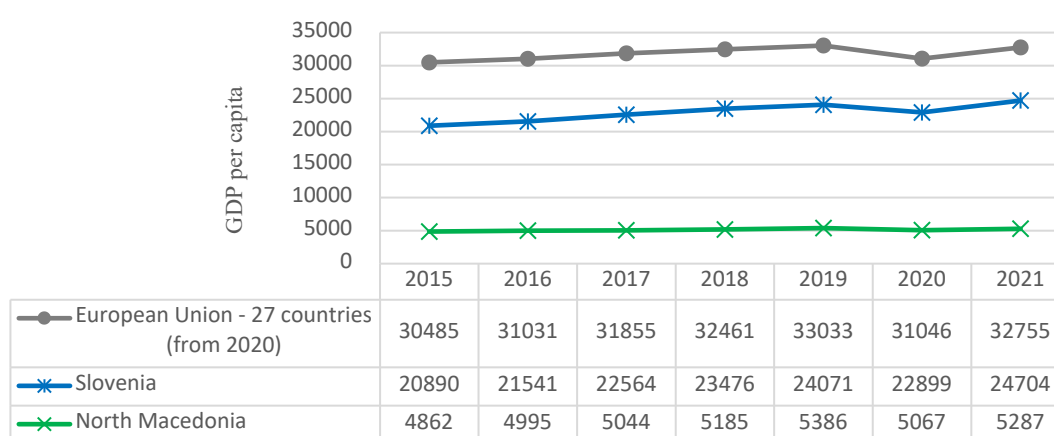


Figure 6. GDP per capita of Slovenia and North Macedonia compared to the aggregate average of European Union countries expressed in values of constant 2015 US\$ (World Bank, 2021)

⁴ The 2022 edition covers developments in 195 countries and 15 territories from January 1, 2021, through December 31, 2021. For a detailed overview of the 25 indicators and research methodology used in creating the reports, please visit <https://freedomhouse.org/reports/freedom-world/freedom-world-research-methodology>.

⁵ The CPI ranks 180 countries and territories around the world by their perceived levels of public sector corruption. To view how this index is calculated, please visit <https://www.transparency.org/en/news/how-cpi-scores-are-calculated>.

Likewise, the percentage of non-agricultural labour in total labour in 2019 was estimated around 96% in Slovenia, and 86% in North Macedonia.

In synopsis, the two countries have been maintaining diametrical developmental trajectories starting before Yugoslavia's formation and lasting until today (see 2021 Human Development Index⁶ which equals 0.918 for Slovenia and 0.770 for North Macedonia; United Nations 2022). In cross-cultural research, establishing historical background is highly important and, in a way, helps to mould the expectations about potential similarities and/or differences between cultures. The participants in this study will have gone through, and "absorbed" the historical, economic, and political conditions of their own distinct environments. However, as intricately discussed in the previous chapter, decades of critical reviews have justifiably warned against this severe overgeneralization and oversimplification.

2.1.1. Healthcare Services and Healthy Ageing

Connecting back to the core premises of this study, it is essential to showcase the quality and status of healthcare, including the availability of healthy ageing services and initiatives in both countries, going back at least three decades. We presume that Slovenia and North Macedonia differ in these aspects as well, although the line is not clearly cut. It would be ideal to understand public and private healthcare services throughout the entire life of our target groups (born between 1957 and 1967), however any data before the 2000s is scarcely available due to poor record keeping, or transition from paper to electronic bureaucratic media. Furthermore, it is well established that the quality of healthcare services and initiatives for healthy ageing have a positive outcome on public awareness, prevention, and early detection of mild, moderate, and severe cognitive decline due to various types of dementia or other factors/ diseases (alcoholism, diabetes, cardiovascular disease, toxin exposure, Parkinson's disease etc.) (Heger et al., 2021; Saunders et al., 2023). In addition to quality of services, there is also the question of

⁶ The index represents a geometric mean of normalised indices for three dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living. Current HDI ranks Slovenia 23rd in the world (very high), whereas North Macedonia is ranked 78th (high). For more information on methodology and calculation, please visit <https://hdr.undp.org/data-center/human-development-index#/indicies/HDI>.

availability of services, and actual implementation of national strategies and guidelines in practice. Using public domain databanks, some of them already introduced in the previous chapter (e.g., Eurostat, World Bank), we are going to present a side-by-side comparison between Slovenia and North Macedonia using indicators for primary health care, mental health, and national initiatives for healthy ageing that are significant for the topic at hand (Table 1).

These carefully chosen indicators provide valuable insight into the actual efficacy of services in both countries and the challenges they face. Somewhat surprising, taking into account the clear discrepancy of economic power between the countries, however, Slovenia and North Macedonia are somewhat comparable in percentage of physician density, number of hospital beds, and percentage of people expressing unmet medical needs. Country reports call to attention the ongoing human resource crisis in health care, namely, there is a low number of physicians and specialists and a high number of nurses. This poses disadvantage to healthy ageing objectives in two ways: a) in both countries this causes a high number of referrals (people 55 and older get more referrals) to specialists; b) specialists are scarce, which means average waiting times are increasingly higher. As extensively discussed in Chapter 1, early detection, and treatment for several potentially modifiable diseases (e.g., hypertension or diabetes) is crucial for maintaining a healthy life and healthy cognitive functioning throughout late adulthood and older age (Kivipelto et al., 2020; Rosenberg et al., 2018). Meaning, prompt access to health services is essential for prolonging the years in which an individual is able to work, participate in the community, exercise, take part in educational programs, socialise, etc. Possible obstacles in this chain of actions promptly turn into risk factors for early cognitive decline, increase the risk for dementia and lower overall quality of life. However, the most striking and meaningful difference between the two countries is in the following problem. The primary health care physician, or simply said, the family doctor is the first point of entry of the individual into the health service system. As opposed to Slovenia, North Macedonian physicians do not have access, nor training, for simple cognitive decline/dementia screening tools (like the Clock Drawing Test or Mini COG used by Slovenian family doctors). Hence, it brings us to the above chain of actions – increased referrals and long waiting times, which are especially inconvenient for individuals from rural areas.

Table 1. Comparison between Slovenia and North Macedonia using indicators for primary health care, mental health, and national initiatives for healthy ageing.

	Indicators	Slovenia	North Macedonia
PHC	Physicians per 1,000 people ^a	3.2 (2018)	2.9 (2015)
	Hospital beds per 1,000 people ^a	4.4 (2018)	4.3 (2017)
	Unmet medical care needs (aggregated population total) ^b	2.9% (2019)	2.5% (2019)
	PHC physician has access to/ trained to perform basic dementia screening test	Yes ^c	No ^d
	Psychiatrists working in mental health sector, per 100,000 ^e	11.9 (2016)	14.4 (2017)
MH	Existence of at least one functional dementia awareness/risk reduction campaign ^f	Yes (national and sub-national) (2017)	Data not available
	Inclusion of basic dementia competences in training of physicians/nurses/social workers ^f	Some (2017)	Data not available
	National plan	National Strategy for Dementia Control (2017–2020) ^c	Action Plan for Healthy Ageing (2020) ^d
NI	Community projects	Smart Villages for Tomorrow (2019-2020) ^g	Rural doctor project (2014) ^d
	Guidelines	Active Ageing Strategy (2018) ^h ; Active Ageing Index 31.1 (rank 23/28) (2018) ⁱ	Integrated Care for Older People - ICOPE scorecard 18/52 (2021) ^d

Note. Most recent years for data are displayed in brackets. Same applies regarding project initiation dates.

PHC – Primary Health Care; MH – Mental Health; NI – National Initiatives.

^a World Bank Open Data (2018)

^b Eurostat (2023), data displayed deliberately before Covid-19

^c Ministry of Health of Slovenia (2016)

^d World Health Organization (2021)

^e Global Health Observatory (2019)

^f Global Health Observatory (2017a) ; Global Health Observatory (2017b)

^g Stojanova et al. (2021)

^h Bedna & Kajzer (2018)

ⁱ Active Ageing Index (2018)

As a note, North Macedonia does have a higher density of psychiatrists working in the mental health sector, while data regarding density of neurologists is missing in both countries.

It is unclear which specialist receives most referrals for screening tests and dementia diagnosis in North Macedonia, nonetheless, lack of awareness and stigma surrounding help seeking and dementia screening poses a much greater risk. Existence of at least one functional dementia awareness/risk reduction campaign in North Macedonia would be of remarkable benefit, but unfortunately, that is not the case. Perhaps it is a problem of documentation and organisation, however gathering from social media and anecdotal evidence, despite lack of official campaigns, smaller independent pop-up projects do exist. For example, there are great efforts for dementia awareness, education and risk reduction made by the Institute for Alzheimer's Disease and Neuroscience in North Macedonia. Slovenia, on the other hand, is more systematic in this domain, having frequent campaigns on a national and regional level. However, there is no clear statistical evidence as to whether these campaigns have directly influenced public opinion on dementia, reduced stigma, improved help seeking behaviour and promoted improvements in physical activity and nutrition for overall brain health. In fact, Slovenia seems to have alarming percentages of alcohol consumption, prevalence of obesity and salt consumption, reflecting a high number of cardiovascular diseases (Albrecht et al., 2021; World Health Organization, 2020).

Furthermore, on the topic of health care accessibility in hard to reach rural areas that we touched upon before, both Slovenia and North Macedonia face great difficulties. Although some programs have been put in place, this field needs further development to breach the gap of inequality between urban and rural dwellers. For instance, the Rural doctor project in North Macedonia has reached more than 160.000 patients since its establishment, according to local government news (World Health Organization, 2021), while the Smart Villages for Tomorrow project in Slovenia has resulted in opening the first of many (in planning) sustainable, person-centred Day Centres for the elderly in a rural mountain area (Stojanova et al., 2021).

When all the evidence is summed up, it is clear that Slovenia, being a long-standing member state, is integrated in the European Union network of funding and support. As a result, the country is expected to maintain EU standards and make constant improvements

upon human rights, patient rights and implement suggested WHO guidelines aimed to better overall standard of living and well-being. These actions are also meticulously documented. North Macedonia, however, is not an EU member, but receives a certain amount of funding for improving regional equality and development, since in the last decade the country has been attempting to improve its status and become an eligible EU candidate. Nevertheless, poor economic development, political instabilities and institutional corruption have stood in the way of improvement for a number of years. In truth, the WHO report “Older people and access to health care in North Macedonia” written in 2021 states that “[t]his assessment of the health and ageing-relevant health care of older people is the first of its kind in North Macedonia” (World Health Organization, 2021, p. 1).

Unexpectedly, when it comes to actual implementation of plans and guidelines into practice, this is where the difference between the countries ends. Despite Slovenia’s discussed advantage on multiple levels, both counties exhibit suboptimal results on objective indices/scorecards. Hence, North Macedonia’s latest ICOPE score (2021) is 18/52, which suggests lacking in all domains within, and outside the national Action Plan for Healthy Ageing (see document for more details on domains and scoring). Similarly, Slovenia’s low rank on the Active Ageing Index (ranked 23rd out of 28 EU member states in 2019) reflects poorly on their Active Ageing Strategy and National Strategy for Dementia Control. The reasons for this paradoxical summary remain only speculative and conceivably the present research might provide a fresh point of view regarding this issue.

2.2. Operationalizing Culture

People have been curious about their neighbouring tribes, colonies or settlements as far as written records can go. Oral stories about the “others” and their seemingly strange customs and beliefs have been passed down for thousands of years. The tendency to find the similarities and differences, to define the values that make “us” and “them” distinct, to analyse and comment on unfamiliar behaviour is part of human nature and predates today’s empirical frame. Anthropology has its beginnings in the eighteenth century during the European Enlightenment, however it was not until the 1850s that this study of humanity emerged as a science (Eriksen & Nielsen, 2013).

Twenty years later, one of the most significant contributions to the field was made by Britain's first professor of anthropology, Edward Burnett Tylor (1832–1917), who wrote the following inexhaustibly cited definition of culture: “Culture, or civilization, taken in its wide, ethnographic sense, is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society.” (Tylor, 1871, p. 1). His pioneering work slowly prompted the inclusion of culture in various other anthropological and psychological disciplines. Wundt wrote several book volumes on cross-cultural psychology in 1900 and Luria explored the effect of culture on cognition in his fundamental neuropsychological studies among the Uzbek people in the 1930s (Ardila, 2020). In the same period, Cora Alice Du Bois introduced projection tests, along with life histories, to strengthen the empirical value of her modal personality research amid the Alorese. Moving from tribal societies towards a large-scale approach, Ruth Benedict and Margaret Mead were the most influential figures in the newly emerging studies of national character that peaked during and after the second World War. However, in the last half of the 20th century, trending concerns with social, political, and human rights issues (in America and Europe alike), urged the scientific community to demand a more evidence-based approach. Anthropological studies of small-scale societies (tribes) were deemed hard to disprove, while national character studies were criticised for promoting universalism and undermining individual differences (Eriksen & Nielsen, 2013).

Perhaps as a response to the needs of his time and in light of the abovementioned academic developments, Geert Hofstede looked beyond the disagreements in theory and worked towards quantifying culture. His publication of “Culture's Consequences - International Differences in Work-Related Values” in 1980 resulted in an explosion of interest in the subject of culture measurement (Taras et al., 2009). The original research utilised a database containing more than 100,000 questionnaires regarding values and related sentiments. These questionnaires were answered by IBM employees in over 50 countries who were surveyed twice over the span of 4 years. Hofstede factor analysed that data as a matrix of 32 questions reflecting values, grouped as national level aggregates. The initial analysis resulted in 4 distinct cultural dimensions: Power Distance, Uncertainty Avoidance, Individualism versus Collectivism, Masculinity versus

Femininity (for a detailed overview of methodology, validation, and updates on Hofstede's model see Hofstede, 2011; Minkov & Hofstede, 2012).

Following Hofstede's success, operationalizing and quantifying culture reached prominent popularity in the 1990s and early 2000s, so much so, that one meta-analysis recognized 121 existing instruments for measuring culture and stated that "97.5% of all reviewed measures contain at least some dimensions that are conceptually similar to those introduced by Hofstede" (Taras et al., 2009, p.360). Out of them, there are several significantly large projects, like for example GLOBE (Global Leadership and Organisational Behaviour Effectiveness) (House et al., 2004); Survey of Values by social psychologist Shalom H. Schwartz (Schwartz & Bardi, 2001); and the World Values Survey (joint with the European Values Study) coordinated by political scientist Ronald Inglehart (EVS, 2021; Haerpfer et al., 2021) which is used in this study (see chapter 4.2. Materials).

However, Hofstede's approach to culture, and most of the emerging research that used his concepts as foundation, was met with elaborate criticism. Moreover, in the pursuit of quantifying culture, disciplines like cross-cultural psychology and cultural neuroscience also failed to resolve some important issues. In continuation, general methodological and theoretical challenges are going to be discussed. While there are a lot of fields where cross-cultural research is being conducted (e.g., economics, management, sociology, psychology, pathology, neuroscience), the subsequent discussion is going to isolate only four challenges, which are particularly relevant to the present study.

Firstly, "culture" and "country" are, more often than not, used as synonyms or interchangeably. Researchers frequently analyse data from several countries or racial groups, but not from several cultures. One obvious argument stands the fact that multiple cultures coexist within a single country or racial group (e.g., there are 98 different cultures identified in 48 countries in Africa; Caucasians are a diverse group comprising more than 50 ethnic groups). There have been extensive efforts to ban the "passport approach" and all-together oversimplification of culture, however, with little success.

Generously funded neuroimaging studies are still using race/country as proxy for culture, automatically subscribing individualism or collectivism to their samples and declaring cross-cultural differences. Such examples can be illustrated with quotes like "our findings systematically revealed comprehensive brain structural differences between young male

Chinese and Caucasians” (Tang et al., 2018, p. 2147) and “[w]e conducted a whole-brain analysis on the three-way interaction of culture (American vs. East Asian), instruction (absolute vs. relative), and congruency (incongruent vs. congruent)”(Hedden et al., 2008, p. 15).

Moreover, in the last decade neuropsychological research has been focused on providing appropriate cultural adaptations of neuropsychological assessment tools, constructing culture-free tests, and improving methodological approaches (Franzen et al., 2021, 2022). However, similar to the above mentioned examples, very often the “culture” part in cross-cultural studies has been equated to the country of origin and nothing more. That, in turn, is bound to give problematic research questions/objectives: “study aimed to compare cross-cultural performance on a comprehensive neuropsychological test battery between Russian and American healthy rural dwelling adults” (Melikyan et al., 2021, p. 364).

To better understand the depth of this issue, we are going to proceed with the second challenge, which is transferring “culture”, or cultural variables, from national level to individual level. Calculating national level data is done by aggregating the survey-type scores of each individual in a given sample (usually it means finding the sample mean, so called “citizen mean”) (Smith et al., 2013). Now, when the opposite is done – disaggregation, we assume that individuals within a sample possess certain cognitive styles or values based on information derived from national level data (e.g., a person from China has a holistic way of processing information because they live in a collectivistic/holistic society).

This shift back and forth between levels can be appropriate in some instances (the Big Five personality factors; McCrae & Terracciano, 2008, in Fischer & Poortinga, 2018), however it is rarely the case in cross-cultural research. As explained by Fischer and Poortinga (2018, p. 697):

“[T]wo variables such as “feeling stressed ” and “following rules at work” can be uncorrelated or negatively correlated when examining the scores of individuals within separate countries. Yet, when the same data are aggregated to the nation level, a positive correlation may appear (Hofstede, 1980) ... if there is a monotonic function describing the relationship between scores at the two levels, the same structure applies across levels, and it then makes sense to use the same concept. In the case of non-monotonic relationships, it is misleading to use the same concepts at the two levels. The former

instance has been referred to as an isomorphic relationship, the latter as a non-isomorphic relationship”.

Therefore, before making inferences and jumping between levels, it is of great importance to check whether the variables of interest have an isomorphic relationship. Failing to do so and ending up with variables that have a non-isomorphic relationship will result in ecological fallacy, which is habitually seen in studies where individualism and collectivism (or similar concepts) are used both for individuals and entire populations (Smith & Bond, 2022). For a detailed preview of the matters discussed above and a more comprehensive outline of studies facing said methodological challenges, please see meta-analysis by Fischer & Poortinga (2018), Poortinga & Fontaine (2022), Smith & Bond (2022) Taras et al. (2009, 2016).

One possible solution to avoid ecological fallacy is to measure a set of chosen cultural components directly in the sample by means of a values survey (e.g., a module from the World Values Survey). This approach has been implemented in several research papers (Chiao et al., 2009; Han et al., 2014; Kirkman et al., 2009) and it will be used in the present study as well. While it does mitigate the predicament of ecological fallacy, it does not eliminate the initial problem, which is setting cultural boundaries.

Researchers have approached this topic from all points of view, for example Ardila (2020) gave an example about Belgium where three cultural and linguistic groups are institutionally recognized and pointed out that choosing to sample only from the Flemish speaking population would be more realistic than equating the entire country to a unitary Belgian culture. In the same context, where a community contains multiple national and ethnic groups, other researchers (Morris et al., 2015) recognize the dynamic interplay of polyculturalism arguing that “individuals take influences from multiple cultures and thereby become conduits through which cultures can affect each other” (p. 631). Therefore, making cultural boundaries “fuzzy and variable” (Fischer & Poortinga, 2018, p. 700). In addition, there has been new evidence suggesting that it might be more useful to broaden the horizon, step away from national borders, and derive culture clusters based on rural/urban dwelling, occupation, socio-economic class, level of political rights and civil liberties, corruption scores etc. (Fischer & Poortinga, 2018; Smith & Bond, 2022; Taras et al., 2016)

In principle, all the different approaches towards defining cultural boundaries are aiming to fulfil three essential conditions in cross-cultural research – homogeneity, differentiation, and permanence (Fischer & Poortinga, 2018). To elaborate, it means that one cultural unit (regarding a certain topic, e.g., cultural values related to tolerance of homosexuality) should have minimal internal variance (homogeneity), significant variance when compared to another group (differentiation) and relative stability over time (permanence). Furthermore, Taras and colleagues (2016) set particular emphasis on homogeneity and differentiation, stating that defining a cultural unit based on country borders is effective only if the following requirements are met: “(1) within-country variance must be small; and (2) between-country variance must be large” (p. 460).

Putting the above into practical perspective, most recent methodological guidelines (e.g., Shiraev & Levy, 2020; Smith & Bond, 2022) urge researchers to report measures of intra-group variability in addition to inter-group statistics. It has been demonstrated that the publishing pressure (Ioannidis, 2019) to find significant cross-country (rarely cross-culture) differences, has overshadowed the facts that differences within a cultural unit are, quite often, larger than cross-country variability. On that point, Fischer and Schwartz (2011) highlight that the proportion of cross-country variability in values ranges from 7 to 25%, while Steel and Taras (2010) report that from 70 to 90% of variance in Hofstede’s values framework lies within countries. Moreover, statistical advances allow easy implementation of multilevel models that are exceptionally useful and recommended (Boer et al., 2018; Poortinga & Fontaine, 2022) in cross-cultural research since relationships between high level variables (e.g., GDP per capita or mean years of schooling) and low level variables (e.g., individual level annual income or educational attainment) can be properly examined (Vijver et al., 2015).

Nevertheless, even when the most advanced statistical methods are applied, culture-comparative research, by default, follows a quasi-experimental design. This leads the discussion towards the third challenge, which is dealing with confounding variables. In a true experimental setting, third variables are more easily predicted and controlled. Yet, when dealing with culture, an unknown confounding variable can potentially correlate with both the independent and dependent variable, thus altering the examined relationship between them. Typical examples of such confounding variables are educational attainment, response style (Ames, 2022), test familiarity, item bias and many more.

Consequently, as it is impossible to control for all unforeseen moderators and/or mediators, the end product of cultural measurement and hypothesis testing should be seen as part of a larger multilevel, multidimensional, and multidisciplinary system. Smith and Bond (2022) neatly depicted this complex system (Chart 1). It is clearly visible that what can be summed up as “cultural context”, is actually an organism of its own, comprised by multiple interconnected elements that eventually exhibit their influences (not all equally) on an individual level. Similarly, prominent research by Chiao and colleagues provided evidence for the interplay, and coadaptation, of cultural, genetic, and environmental factors which together underline measurable differences in individual behaviour (culture–gene coevolutionary theory) (Chiao et al., 2010; Mrazek et al., 2013).

Lastly, the fourth challenge is lack of cultural diversity and sensitivity in the research community (Franzen et al., 2021), or better known as the WEIRD problem - Western Educated Industrial Rich and Democratic (Henrich et al., 2010).

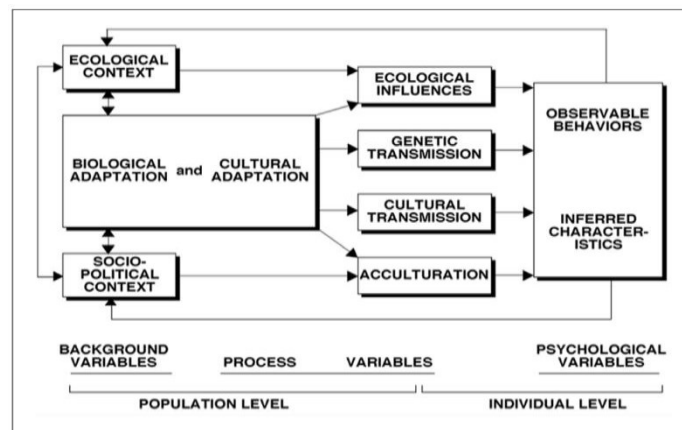


Chart 1. Linkage between cultural context and the individual (Smith & Bond, 2022, p. 744)

Curiously, WEIRDness is embedded into multiple layers of research practices, and is not only limited to “convenience sampling” of WEIRD societies, which apropos, has produced a paradox of its own. Namely, after the initial issue had been spotlighted, researchers turned their interest to small-scale societies, creating yet another gap, and as Barrett (2020, p. 447) points out, “there is a large, unsampled middle of people on earth who are neither (1) college students nor (2) subsistence-level villagers. When it comes to coverage of the human species, we can do better”. To improve the state of this newly created paradox, Muthukrishna et al., (2020) built an innovative open-source tool for calculating the psychological and cultural distance between any two cultural units, thus urging researchers to tackle the unexplored middle and go beyond the United States –

Japan duo. For instance, it would be noteworthy to examine Moldova and Estonia, since they have similar cultural distances from the United States (extreme end of the WEIRD continuum), but are nowhere culturally equal to each other (for more information please visit www.world.culturalytics.com).

Further on this topic, when a research tool is developed in a WEIRD nation (e.g., Canada), and then used in cross-cultural research, the home culture automatically becomes a reference point, thus emphasising construct, method, and item biases (Bennis & Medin, 2010; Muthukrishna et al., 2020). In response, diverse research teams should be formed from the beginning stages of writing a culture comparative research proposal. If needed, teams should be expanded in order to contain individuals that have a good understanding of the culture, customs and language of the cultures intended for study (Fischer & Poortinga, 2018). In the age of computer mediated communication this can be a relatively straightforward process as by using online tools, experts and researchers from all backgrounds are not tied to a physical location. For a practical example see the protocol of a Delphi study meant to improve cultural sensitivity and diversity in neuropsychological assessment in the European Union (Franzen et al., 2021).

In summary, operationalizing culture in the field of psychology, or related fields, seems to have no clear formula. Taking in account the above discussed challenges, it is clear why there is a huge gap in literature when it comes to considering cultural values as valid predictors in the field of cognitive neuropsychological research. As much as it is easy to observe how people from one side of the globe dress, behave, eat, and talk differently than people from other parts, it is extremely difficult to measure the underlying principles of that overt behaviour. Wrapped with so many challenges, diving into culture-comparative research might seem rather futile, however, by following recommended steps it is possible to reach a middle ground between an “eclectic” and “essentialist” approach while also avoiding ecological fallacy. To be more precise, the first step would be finding a middle ground between: 1) freely choosing the way in which they narrow down the malleable construct of culture (eclectic); and 2) acknowledging the necessary assumption that individuals belonging to a cultural group share more characteristics between themselves, than with individuals from another cultural group (essentialist). Moreover, as it was discussed in this chapter, it is crucial to be mindful of isomorphism and (dis)aggregation of both high level and low level cultural variables in order to

maintain ecological integrity. Additionally, research reports should be transparent and include information on standard deviations of aggregated means within, and between, cultural units. Meaning, if data analysis yields such results, lack of cross-cultural variability should be accepted and displayed, despite prior expectations. Last but not least, authors (Barrett, 2020; Broesch et al., 2020) call upon ethical considerations in cross-cultural research, emphasising the importance of prioritising the selection of cultural communities (be that countries, SES classes, gender, or other) that could benefit the most from the practical implications of the conducted research and reach maximum community involvement.

2.2.1. Defining Cultural Units: Slovenia and North Macedonia

Following the above guidelines and methodological considerations, the two cultural units in this study are going to be defined based on multiple indicators, besides geographical borders. Research has shown that the oversimplified “country equals culture approach” accounts for a small percentage of variance in measured values between countries, and low value consensus within countries (Fischer & Schwartz, 2011; Steel & Taras, 2010). Therefore, for more sophisticated cultural boundaries the following indicators are going to be considered:

- a) High versus low wealth (population level indicator: GDP per capita). Slovenia has been shown to have high economic stability and wealth for the last 70 years, compared to North Macedonia (see Figures 2 and 6).
- b) Good versus poor safety (population level indicators: Freedom House index for political rights and civil liberties; Transparency International corruption perception index - CPI). As discussed in Chapter 2.1., North Macedonia has a poor Freedom House index compared to Slovenia. Likewise, the CPI follows a similar trend.
- c) Low versus high modernization and progress (population level indicator: Human Development Index – HDI). Slovenia has a much higher HDI compared to North Macedonia (see Chapter 2.1.).

In this way, we are not only comparing cultures of countries, but cultures of “geographic [or social] environments characterised by certain level of wealth, freedom, equality,

instability, and globalisation”, as it was empirically proven to be more suitable and explain a larger percentage of variance in values, especially when the environments being compared are drastically different (Taras et al., 2016, p. 481), like in the case of Slovenia and North Macedonia.

Finally, it is essential to declare that the two cultures have not been chosen solely based on their indicators. As pointed out by several papers (Fischer & Poortinga, 2018; Franzen et al., 2021; Muthukrishna et al., 2020) it is important for the researcher (or the research team) to be deeply familiar with the cultures involved in their culture-comparative study. Therefore, as the sole author, I disclose that my native culture and language is Macedonian, having been born and graduated high school in North Macedonia. However, for the purpose of furthering my education I moved to Slovenia in 2015, making it my permanent residence throughout early adulthood. Having attained an undergraduate degree in psychology, I have native-level mastery of the Slovenian language and internalised insight of the culture built through years of work in education, community involvement, as well as work with dementia patients and their caregivers.

In conclusion, this thesis includes not only empirical evidence for defining the two cultural units, but also anecdotal knowledge of expert opinions outside of official reports, innate understanding of institutional mechanisms, first-hand participation in cultural and religious customs, and active consideration of the possible biases resulting from being an ingroup (or outgroup) member of the cultures in question.

2.3.Survival and Self-expression Values

In the last four decades, research on culture has converted to research on values, although cultural values as we know them in psychology represent only one facet of what constitutes culture in its broad sense (Smith & Bond, 2022; Taras et al., 2016). If we refer to Chart 1, it is clear that numerous factors influence what we inherently measure with self-report questionnaires. Exploring this correlation, research has shown that cultural values are tightly linked to one factor in particular - socio-economic development (e.g., Tabellini, 2010). Hence, evidence suggests that in an economically powerful cultural unit it is highly likely to find values linked to individual autonomy, self-realisation, equality, and democracy, while the likelihood for these values drops in low wealth cultures

(Inglehart, 2007). Except, the relationship between economy and values is not as simple as it was initially presented in the early Marxist modernization theory. A revised modernization theory by Inglehart and Welzel (2005) emphasises the dynamic path of human development, moving from the need to guarantee survival, to the liberty of practising self-expression.

Driven by the scarcity hypothesis, the authors argue that people's priorities are a mirror of their socioeconomic circumstances. To elaborate, when the most crucial needs for material sustenance and security are unmet, people prioritise values linked to survival, like income stability, low outgroup tolerance, or child rearing practices focused on habits of hard work and affluence. On the other hand, when the conditions are prosperous, and individuals can "afford" to take basic survival for granted, they tend to shift their priority towards self-expression and adopt values that focus on quality of life, gender equality, social justice and promoting imagination and tolerance in children (Inglehart, 2007).

This trend was extracted from the WVS (Haerpfer et al., 2021), which measures underlying values in more than 80 societies and numerous data collection waves, using a large set of attitude items (see Introduction and Methods). Starting from there, Inglehart and Baker (2000) distinguished two dimensions of values at both individual and country level. The first dimension is above-described survival versus self-expression, and the other dimension is traditional versus secular-rational. As the title of the thesis suggests, we are going to use only the first dimension for several reasons.

Firstly, there is high correlation between the level of self-expression values and data from Freedom House, which is one of four indicators used to define Slovenia and North Macedonia as distinct cultural units (Inglehart & Welzel, 2005).

Secondly, as mentioned before, scarcity and existential security are detrimental in predicting how value priorities are organised in both individual and population levels. Like presented in Figure 5 and Appendix 3, North Macedonia has a strikingly high level of individuals at risk of poverty and social exclusion, as well as percentage of households with children that cannot afford a decent meal every second day. Shown statistics date back to 2015 for the purpose of clarity, however by following one of the reference links, the same pattern can be observed lasting two decades (or even longer, considering that the countries were on different development levels during Yugoslavia). Just by logic alone, it is safe to expect higher levels of survival values in North Macedonia and higher

levels of self-expression values in Slovenia. This is also backed up by data, from WVS wave 4 (1999-2004)⁷ and wave 7 (2017-2022), where the SSEV index scores (oldest to latest, respectively) for Slovenia are 0.38 and 1.25; while for North Macedonia are -0.72 and -0.24. Score indices were used to plot results on a world cultural map (visit <https://www.worldvaluessurvey.org/WVSContents.jsp> for visual aid), therefore more negative scores which are further below 0 indicate higher level of survival values, whereas scores greater than 0 indicate higher levels of self-expression values.

Lastly, the revised modernization theory points out the intertwined relationship between self-expression needs and human development rising through the shift from industrial to post-industrial societies. The HDI, which was also used as a culture-grouping indicator, paints a good picture of the multiple domains in which modern societies have improved existential safety and allowed people to focus on goals above urgent survival (Inglehart & Welzel, 2005).

2.4. The Relationship between Cultural Values and Cognition

Building upon the last statement from the previous chapter, we are going to briefly examine how focusing on goals other than existential stability are linked to cognition. In more developed societies, self-expression values, and the sense of existential safety as their “enabler”, are associated with a larger percentage of individuals earning a higher education degree. This is also associated with the societies’ higher demand for cognitive labour, or as Florida (2004) explains, the rise of the creative class. As it is well established, higher educational attainment and cognitively demanding work positions are both positive predictors for higher cognitive reserve.

Furthermore, when survival values are more dominant, people tend to express discrimination towards outgroups and minorities, reject foreign influences and perceive them as threatening. This, along with economic constraints, makes it less likely for individuals with priorities set on existential sustenance, to travel, try unfamiliar foods, learn new languages, and be exposed to diverse cultural entertainment. Moreover, other leisure activities such as exercise, or participation in charities and social clubs become

⁷ Wave 4 is the oldest dataset where there is no missing data for North Macedonia, together with wave 7 it offers a quick past-present overview.

less important, and hence neglected (Florida, 2004; Inglehart, 2007; Inglehart & Welzel, 2005; Welzel, 2010). Life-long education, learning new skills, socialisation and exercise are vital for healthy cognitive functioning through midlife and adulthood. However, these mechanisms are very complex and multi-layered, and we must be careful not to draw conclusions that being a part of a developed society and having self-expression as a priority is the only way for a person to have proper cognitive stimulation and age healthily.

For example, there is evidence that more Slovenians (which on a national scale have higher self-expression values) aged 55-65 more often participate in leisure activities and social/cultural clubs compared to the same age group in North Macedonia (where survival values are dominant) (Atlas of European Values, n.d.). Nevertheless, the record of dementia prevalence in both countries is contra intuitive, with Slovenia reaching 1.65% of the total population and North Macedonia only 0.89% (Georges et al., 2020). This might be due to the healthcare system issues in North Macedonia discussed in chapter 2.1.1, which result in underdiagnosis, or the slightly higher number of persons aged 65 and over in Slovenia (World Bank Open Data, 2022).

Yet, this topic is very new and all theoretical frameworks, in addition to statistical data, need to be interpreted with caution and not taken out of context. Therefore, we are expecting survival and self-expression values to have the role predictors, since they reflect the workings of multiple overlapping constructs like economy, politics, freedom, healthcare, scarcity, security, human development, and more. Perhaps this analysis will provide a fresh perspective on the relationship between our chosen cultural values and cognition.

3. AIM OF THE STUDY AND HYPOTHESES

This research aims to investigate if cultural values (SSEV) can predict cognitive reserve (CRIq) and cognitive performance (Auto-GEMS) in healthy older adults from Slovenia and North Macedonia. Drawing insights from an open-source database highlighting consistently elevated self-expression values in Slovenia (in contrast to the opposite trend in North Macedonia), the hypothesis was that placing greater emphasis on self-expression values would correlate with higher CRIq and Auto-GEMS scores, especially in Slovenia. Conversely, prioritising survival values, common in developing countries like North

Macedonia, was expected to have the opposite effect. Additionally, given previous research indicating the positive impact of cognitive reserve on cognitive performance (Mondini et al., 2022; Nogueira et al., 2022; Nucci et al., 2012; Stern et al., 2019), the present research hypothesised that individuals with higher CRIq scores from each cultural unit would also have better Auto-GEMS results.

This study seeks to explore the complex interrelationships among individual values, cognitive reserve, and cognitive performance, thereby enhancing our nuanced comprehension of these connections within the specific cultural landscapes of Slovenia and North Macedonia. By undertaking this investigation, we aim to uncover significant insights into how personal values influence cognitive functioning, particularly in healthy older adults. This endeavour holds promise for shedding light on the intricate dynamics at play when cultural values are incorporated into cognitive neuropsychology research.

4. METHOD

4.1. Participants

The sample consists of 80 participants in total, out of which 43 are from North Macedonia (35 female, 8 male, $M=58.47$ years old, $SD=3.16$) and 37 from Slovenia (23 females, 14 males, $M=59.76$, $SD=3.88$). All participants were native speakers of the language where the test was conducted. They were selected through multiple channels but primarily by word of mouth and snowball sampling, as well as invitations to participate in the study shared on social media. In both countries, flyers with links to the study were also dispersed in local day centres for the elderly and other social clubs where the preferred age group frequents. Moreover, since the aim is to investigate healthy older adults, only individuals who did not declare a neurological, psychological, or medical diagnosis and/or treatment were included (for an overview of diagnoses and/or treatment that does not fit inclusion criteria please find the self-declaration question under Appendix 1). An addition to the inclusion criteria was that participants had to be between 55 to 65 years of age, however due to very low completion rate it was necessary to include several participants 5 years older/younger than the required age. Namely, out of 112 individuals from Slovenia that had opened the link and started testing (not considering 5 individuals

excluded due to ongoing medical treatment, and 45 who discontinued testing before the first question), only 33.04% of them completed the entire battery without stopping early or skipping crucial segments. Similarly, in North Macedonia 167 individuals attempted the testing (minus 26 excluded due to ongoing treatment, and 94 that stopped before the first question), however, only 25.75% out of them completed it in full.

4.2. Materials

Materials in this study were subjected to literal back-translation (English-Macedonian-English and English-Slovenian-English), following a culture-specific and language-specific adaptation of certain words/phrases for which the literal translation was not satisfactory in either Macedonian or Slovenian. Lastly, the corrected materials were proofread by a lector in both languages. When it comes to the format, all materials were made suitable for computerised self-administration using two online survey platforms, Qualtrics and JATOS. Combining the two online survey platforms, a single shareable link of the complete test battery was created, allowing a seamless automatic test flow.

- **Survival versus Self-expression Values (SSEV) Scale (Inglehart & Welzel, 2005)**

The Survival versus Self-expression Values Scale is a product of a factor analysis conducted on hundreds of relevant items from the first four waves of the Values Surveys, which tap into the variation of people's attitudes, beliefs, and values in cultures across the globe (more than 200 surveys in 78 societies on six continents from 1981 to 2001). Both individual-level analysis and aggregate-level analysis of relevant item responses on the Values Surveys show comparable factor loadings (see Appendix 2 for the full set of items, dimensions, and factor loadings). The latest version of the Survival versus Self-expression Values Scale contains only five carefully chosen items (see Table 2) which appear in all four survey waves. Nevertheless, these five items are very strongly correlated ($r = .96$) to the initial version containing eleven items (Inglehart, 1997; in Inglehart & Welzel, 2005). Likewise, the Survival versus Self-expression dimension correlates with a much broader list of items (refer to Appendix 2.1) reflecting the same underlying values (item responses typical of Survival values are linked to economic stability, traditional

gender roles, low tolerance of outgroups, little environmental engagement, while the opposite is true for responses typical of Self-expression values).

In order to transform the SSEV scale into a format fit for computerised self-evaluation, items from Table 2 were put into an online survey tool Qualtrics. Results were later downloaded as an Excel spreadsheet and calculated using the procedure below.

Table 2. Survival versus Self-expression Values (items and standardisation scoring)

	Survival = below 0.5		Self-expression = above 0.5	
Standardized scores from 0.00 to 1.00	0.00	0.33	0.66	1.00
Unstandardized 4-point Likert scale	1	2	3	4
Can homosexuality always be justified, never be justified, or something in between?	Never	Something in between	Always	
Have you ever signed a petition, might do it, or would never do it under any circumstances?	Would never do it	Something in between	Have already signed	
Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?	Need to be very careful	Something in between	Most people can be trusted	
Taking all things together, would you say you are...	Not at all happy	Not very happy	Rather happy	Very happy
Materialist / Post-materialist Index	Materialist	Rather Materialist	Rather Post-materialist	Post-materialist

Since all of the items have been simplified to take the form of a 4-point Likert scale, 1 is for strongly agree, 0.66 for agree, 0.33 for disagree, and 0 for strongly disagree (same logic is applied for the equivalent response options in all items). After the average of the standardised scores is calculated, scores above 0.5 indicate a rather supportive position, and scores below 0.5 a rather dismissive position to self-expression values.

The closer a score is to 0, the more intense is the dismissal; the closer it is to 1.0, the more intense is the support (Welzel, 2010).

The last item that is part of the SSEV Scale is the Materialist/Post-materialist index (Inglehart, 1971) where respondents are asked to answer the following question: “If you had to choose among the following things, which are the two that seem most desirable to you?”. They are presented with the below list of statements, from which they need to mark their first and second choice.

- Maintaining order in the nation. (M)
- Giving the people more say in important political decisions. (PM)
- Fighting rising prices. (M)
- Protecting freedom of speech. (PM)

The author assesses the first and third statement to be Materialistic, while the second and fourth are considered post-materialistic. The scoring is straightforward, a score of 4 ("Postmaterialist") is given to a respondent who chooses two post-materialist items as first and second priority. Furthermore, score 3 ("Rather post-materialist") is given if a post-materialist item is chosen as first priority and a materialist item as second. A respondent receives score 2 ("Rather materialist") if they choose a materialist item as first priority and a post-materialist item as second. Lastly, a score of 1 ("Materialist") is given to a respondent who chooses two materialist items as both first and second priority.

- **Auto Global Examination of Mental State (Auto-GEMS) (Mondini et al., 2022)**

Auto-GEMS is a computer adapted self-evaluation test that contains 11 items designed to assess a spectrum of cognitive skills, including Orientation in time and space, Memory, Working memory, Visuo-spatial, Visuo-constructional and Planning abilities, Perceptual and visual Attention, Language (encompassing Naming, Comprehension, and Verbal fluency), and Pragmatics. The computer adaptation and automatic scoring was done on the open-source JATOS platform, which allows the scores of each individual to be downloaded in an Excel spreadsheet.

It is actually a version of the paper-and-pencil GEMS, demonstrating robust internal consistency, implying substantial correlations between individual tasks and the overall score. Additionally, it exhibits strong correlations with both an extensive

neuropsychological battery (ENB-2, Mondini et al., 2011; in Mondini et al., 2022) and a widely recognized cognitive screening tool (MoCA, Nasreddine et al., 2005; in Mondini et al., 2022). Each of the 11 items yields a raw score, proportionally contributing to the final score, ensuring an unbiased representation of cognitive profiles without specific emphasis on any particular function. Importantly, Auto-GEMS does not target any specific diagnosis or disorder.

Noteworthy is the consideration of cut-offs, which takes into account not only age and education but also a cognitive reserve score, offering more context and information for the purpose of evaluation. Hence, an automated version of the Cognitive Reserve Index Questionnaire (CRIq, Nucci et al., 2012) is integrated into the computer-adapted Auto-GEMS.

- **Testing familiarity** was a single item question: “How many times have you been subject to a neuropsychological examination/cognitive testing/IQ testing conducted by a psychologist/psychiatrist/neurologist/other trained professional?” on a 3-point scale given the following options: “Never”, “Once” and “Twice or more times”.

4.3. Procedure

The participants had to access the test battery via a link which is available in Slovenian (www.bit.ly/TestirajMe), as well as in Macedonian (www.bit.ly/TestirajSe). The link was shared with the participants via social media, email, or written on printed posters/flyers. Two online platforms were used to create a singular test battery, JATOS for the Auto-GEMS, and Qualtrics for the SSEV items, which allowed automatic scoring downloadable in an Excel format. Every instrument is self-administered and computer-based and participants received written and audio instructions in their native language making it easy to complete the testing autonomously. The instructions pointed out that it is mandatory to choose a quiet environment and use a computer or laptop device with functional audio (test battery is not suitable for smartphones). The total time needed to complete the battery did not exceed 20 minutes and technological assistance was offered to participants that did not have experience with computer-based testing.

4.4. Data Analyses and Results

Data analysis was done using IBM SPSS 23. Basic sample characteristics like gender, values and test familiarity are described in Table 3 using frequencies and percentages. We can see that gender is not equally distributed, with the sample from North Macedonia being 81.4% female (18.6% male) and the sample from Slovenia 62.2% female (37.8% male). Regarding the SSEV scale, going back to Section 4.2 (Materials) and looking at Table 2 it is evident that the SSEV score is a continuum that ranges from 0 to 1, however the cut-off at 0.5 suggested by the authors enables transforming the score into a dichotomous variable as well. Therefore, 51.2% of the participants from North Macedonia had survival values (48.8% self-expression values), while 86.5% of the participants from Slovenia had self-expression values (13.5% survival values). Test familiarity did not differ significantly between the two samples, as was proven by the Wilcoxon rank-sum test, $z=-0.34$, $p=0.73$. Worth noting is that the vast majority of participants from North Macedonia (72.1%) and Slovenia (70.3%) were never subjected to neuropsychological examination, cognitive testing, or IQ testing.

Table 3. Descriptive statistics using frequencies and percentages displayed by country.

		North Macedonia		Slovenia	
		Frequency	Percent	Frequency	Percent
Gender	Male	8	18.6	14	37.8
	Female	35	81.4	23	62.2
Values	Survival	22	51.2	5	13.5
	Self-expression	21	48.8	32	86.5
Test familiarity	Never	31	72.1	26	70.3
	Once	9	20.9	6	16.2
	Two or more times	3	7.0	5	13.5

Furthermore, descriptive statistics and normality tests including scale-type variables were examined by country and displayed in Table 4 for Slovenia, and Table 5 for North Macedonia. In the Slovenian sample, the age, all three segments of the CRIq questionnaire (education, work, and leisure), as well as the total CRIq score are normally distributed (Shapiro-Wilk $p > 0.05$), the Auto-GEMS total score and the SSEV score are not normally distributed (Shapiro-Wilk $p < 0.05$). Moreover, in the Macedonian sample,

the age, CRI_Work, CRIq and the SSEV score are normally distributed (Shapiro-Wilk $p > 0.05$), while the education and leisure segments of CRIq, as well as the Auto-GEMS total score are not normally distributed (Shapiro-Wilk $p < 0.05$).

Table 4. Descriptive statistics and normality tests for Slovenia (N=37, Missing=0)

	Mean	SD	Median	Min	Max	Skewness	Kurtosis	Shapiro-Wilk p
Age	59.76	3.88	61.00	49.00	66.00	-0.86	0.97	0.06
Schooling	15.84	3.30	16.00	8.00	21.00	-0.28	0.09	0.02
CRI_Edu	119.54	12.35	119.00	92.00	142.00	-0.12	-0.47	0.48
CRI_Work	129.73	24.43	129.00	86.00	189.00	0.56	0.11	0.28
CRI_Leisure	119.35	25.10	122.00	74.00	176.00	0.34	-0.62	0.37
CRIq	130.22	22.89	127.00	86.00	191.00	0.40	0.19	0.74
Auto-GEMS	88.92	9.26	92.35	67.51	100.00	-0.66	-0.74	<0.01
SSEV	0.69	0.17	0.73	0.26	0.93	-0.84	0.29	0.02

Beyond descriptive means, differences between the two samples were assessed using an Independent Samples T-test for normally distributed variables, and an Independent Samples Mann-Whitney U-test for the variables with non-normal distribution.

Since inclusion criteria was centred around the age of 55 to 65, it was confirmed that there are no significant differences in mean age between the sample from Slovenia (M=59.76, SD=3.88; Table 4) and North Macedonia (M=58.47, SD=3.16; Table 5), $t(78)=-1.64$, $p=0.10$. Likewise, the cohort in this study was specifically chosen to minimise differences in years of schooling between the samples. Judging by descriptive statistics, years of schooling in North Macedonia (M=14.72, SD=2.23) are only slightly lower compared to Slovenia (M=15.84, SD=3.30), but nevertheless it was found that the means between the samples are significantly different, $z=-1.97$, $p=0.04$.

Table 5. Descriptive statistics and normality tests for North Macedonia (N=43, Missing=0)

	Mean	SD	Median	Min	Max	Skewness	Kurtosis	Shapiro-Wilk p
Age	58.47	3.16	58.00	51.00	65.00	0.07	-0.36	0.46
Schooling	14.72	2.23	16.00	8.00	21.00	0.33	2.73	<0.01
CRI_Edu	114.60	10.93	113.00	91.00	146.00	0.82	0.84	0.02
CRI_Work	115.28	22.70	112.00	76.00	188.00	0.88	1.46	0.08
CRI_Leisure	117.00	30.06	119.00	74.00	174.00	0.21	-1.27	0.01
CRIq	120.77	23.08	119.00	82.00	192.00	0.60	0.74	0.29
Auto-GEMS	87.24	8.41	88.15	61.45	100.00	-1.10	1.61	0.01
SSEV	0.47	0.19	0.46	0.07	0.80	-0.15	-0.80	0.13

When it comes to the CRIq and its segments (education, work, and leisure), it was expected for the Slovenian sample to have overall higher mean scores compared to North Macedonia. Descriptive statistics from Table 4 and 5 confirm this notion, however only differences in CRI_Education (Slovenia: M=114.60, SD=10.93 and North Macedonia: M=114.60, SD=10.93) and CRI_Work (Slovenia: M=129.73, SD=24.43 and North Macedonia: M=115.28, SD=22.70) were statistically significant ($z=-2.14$, $p=0.03$ and $t(78)=-2.74$, $p<0.01$ respectively). Despite the sample from North Macedonia having a lower CRIq (M=120.77, SD=23.08) compared to the Slovenian sample (M=130.22, SD=22.89), it was not statistically significant $t(78)=-1.83$, $p=0.07$. Same goes for CRI_Leisure scores, which were not significantly different as expected $z=-0.53$, $p=0.59$ (M=119.35, SD=25.10 in Slovenia and M=117.00, SD=30.06 in North Macedonia). Furthermore, it was also hypothesised that the Slovenian sample (M=88.92, SD=9.26) would perform better on the Auto-GEMS compared to North Macedonia (M=87.24, SD=8.41), however this resulted in non-significant findings $z=-1.27$, $p=0.20$, as the two samples have quite similar mean scores.

Lastly, as displayed in Figure 7, SSEV scores differ greatly between North Macedonia (M=0.47, SD=0.19) and Slovenia (M=0.69, SD=0.17), $z=-4.70$, $p<0.01$, with Slovenia leaning towards self-expression values, and North Macedonia towards survival values.

It is important to note that scores larger than 0.5 and reaching 1 represent prioritisation of self-expression values, while opposite is true for Survival values.

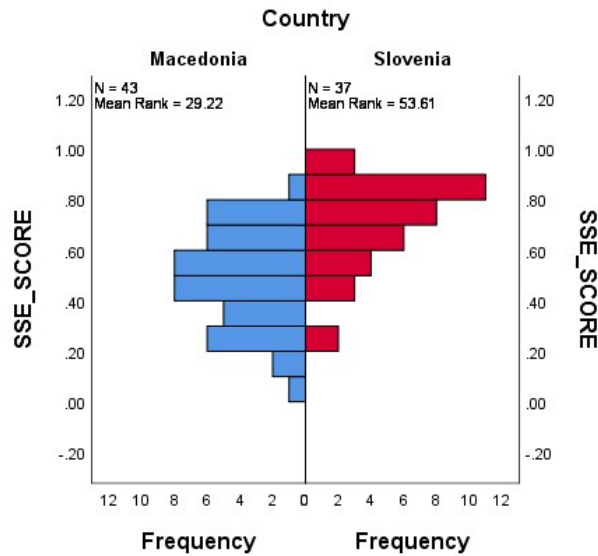


Figure 7. Bar chart representation of the SSEV scale score distribution across the two country samples.

One of the main hypotheses in this study is that SSEV predicts cognitive performance. Additionally, in line with previous literature, we expect cognitive reserve to be a predictor of cognitive performance. Therefore, to examine the predictors of cognitive performance a multiple regression analysis was used. Moreover, we hypothesised that SSEV can also explain the variance in cognitive reserve, for which a linear regression analysis was performed. In continuation we are going to display these results starting with models where cognitive performance, measured by the Auto-GEMS score, is a dependent variable and then move on to examine the influence of SSEV on cognitive reserve measured by CRIq.

The first step was controlling for the influences of age and gender. In both samples this effect was non-significant (North Macedonia: $\beta_{age}=-0.088$, $\beta_{gender}=-0.227$, $p>0.05$; Slovenia: $\beta_{age}=0.109$, $\beta_{gender}=0.297$, $p>0.05$). Secondly, based on the hypothesis that CRIq as well as SSEV can predict the Auto-GEMS score, the first model was constructed. However, seeing that Model 1 (Table 6) was not significant either in the sample from North Macedonia, or Slovenia, we decided to explore a second model where we kept cultural values (SSEV) as a predictor and added years of schooling as a raw number outside of the CRI_Education scoring, as several studies have used years of education as

an indicator for cognitive aptitude (Avila et al., 2021; Chapko et al., 2018; Quesque et al., 2020). Hence, results showed that in the sample from North Macedonia, Model 2 proved significant and explained 15% of variance ($R^2=0.150$, $p<0.05$) in the Auto-GEMS score. Both predictors were positively related to the Auto-GEMS score, however only SSEV was significant. It means that participants with point higher SSEV (higher preference for self-expression values), scored on average 0.37 ($\beta=0.370$, $p<0.05$) points better on the Auto-GEMS.

Table 6. Predictor values (β) of multiple linear regression models with the Auto-GEMS score as a dependent variable.

Auto-GEMS (North Macedonia)				Auto-GEMS (Slovenia)			
Model 1	β	Model 2	β	Model 1	β	Model 2	β
CRIq	-0.071	Schooling	0.186	CRIq	0.350	Schooling	0.194
CRI_Education	0.368	SSEV	0.370*	CRI_Education	-0.405	SSEV	-0.008
CRI_Work	-0.216			CRI_Work	0.319		
CRI_Leisure	-0.083			CRI_Leisure	-0.071		
SSEV	0.453			SSEV	-0.096		
$R^2 = 0.212$		$R^2 = 0.150^*$		$R^2 = 0.122$		$R^2 = 0.038$	

Note. * $p<0.05$.

The effects of schooling and SSEV described above are also visible in Figure 8. It is clear that schooling does not have a strong correlation with the Auto-GEMS score, but

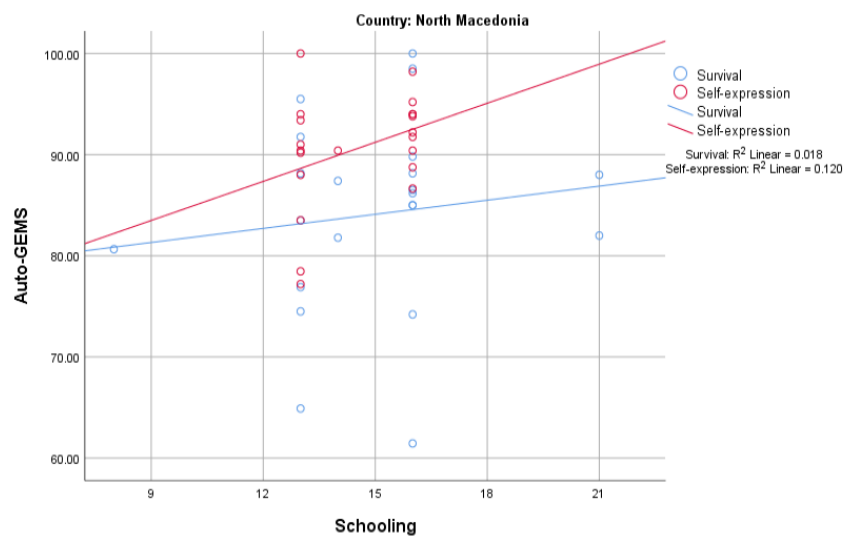


Figure 8. Simple slope plot representation of the effects of schooling on the Auto-GEMS score for participants showing higher self-expression values versus survival values in North Macedonia

nevertheless its effects are stronger for participants from North Macedonia that have higher self-expression values. To further understand the results from the simple slope plot, it was examined whether the interaction between schooling and SSEV would be a good predictor of the AUTO-gems score. This interaction indeed proved significant, but it explained 14% of variance ($\beta=0.381$, with $R^2=0.145$, $p<0.05$), which is slightly lower than 15% percent in Model 2.

The same concept was examined in the Slovenian sample, and in Figure 9 it is clearly visible why Model 2 was not significant in this instance. Namely, up until 15 years of education, years of schooling have a stronger effect on the Auto-GEMS score for participants that exhibit higher self-expression values. However, after years of schooling exceeds 15, this relationship reverses. It shows an absence of a linear relationship, or a trend in the data. Consequently, the interaction of SSEV and schooling was not a significant predictor ($\beta=0.119$, with $R^2=0.014$, $p>0.05$), unlike in the sample from North Macedonia.

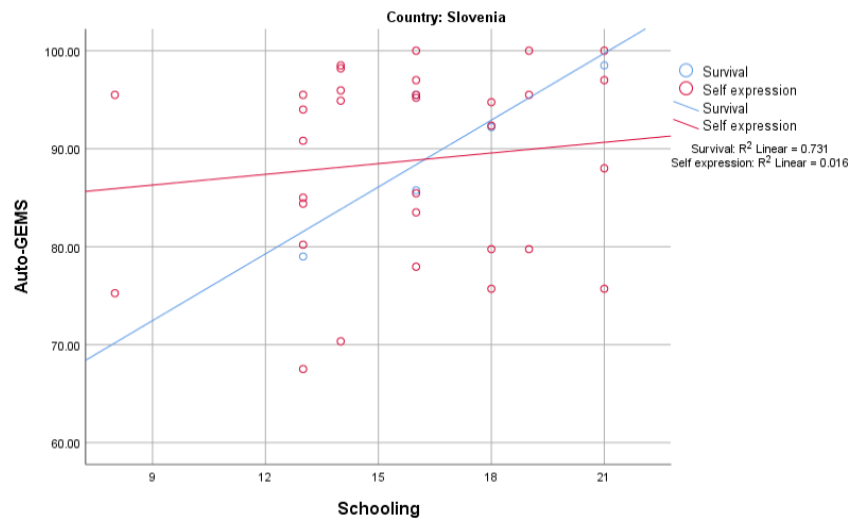


Figure 9. Simple slope plot representation of the effects of schooling on the Auto-GEMS score for participants showing higher self-expression values versus survival values in Slovenia.

Further, we are going to proceed to analyse the effect of SSEV on CRIq with a linear regression model. Beforehand, it was controlled for the influence of age and gender on CRIq in both samples, and as expected this was proved non-significant (North Macedonia: $\beta_{age}=-0.031$, $\beta_{gender}=-0.065$, $p>0.05$; Slovenia: $\beta_{age}=-0.131$, $\beta_{gender}=0.013$, $p>0.05$). To better understand the distribution of our data and the relationship between SSEV and CRIq, we created a scatter dot graph for each of the samples.

This is visually displayed in Figure 10 and Figure 11. In the Slovenian sample, most participants that showed prioritisation of survival values are on the lower end of the CRIq score (Figure 11), while in the sample from North Macedonia there is not such a clear-cut distinction, since certain individuals with survival values scored evenly, or higher than individuals who expressed self-expression values (Figure 10).

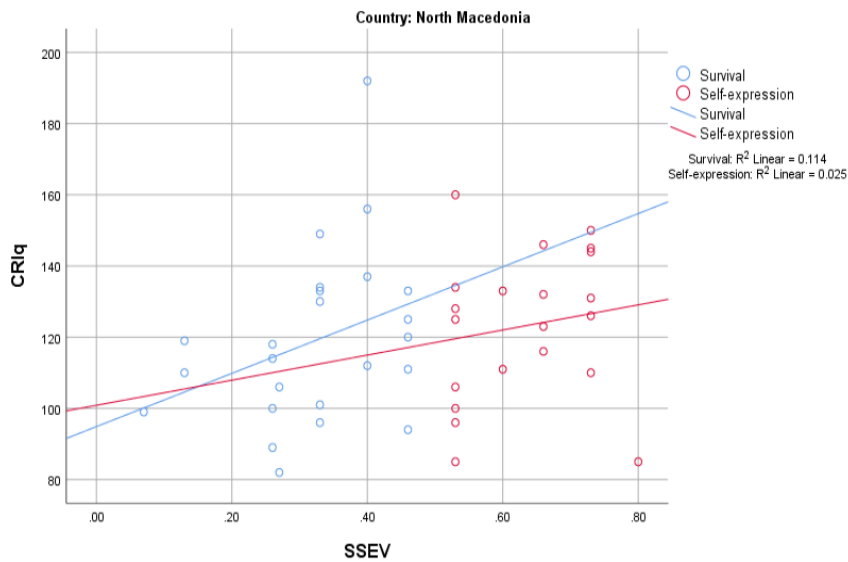


Figure 10. Scatter dot plot representation of the effects of SSEV on the CRIq score for participants from North Macedonia.

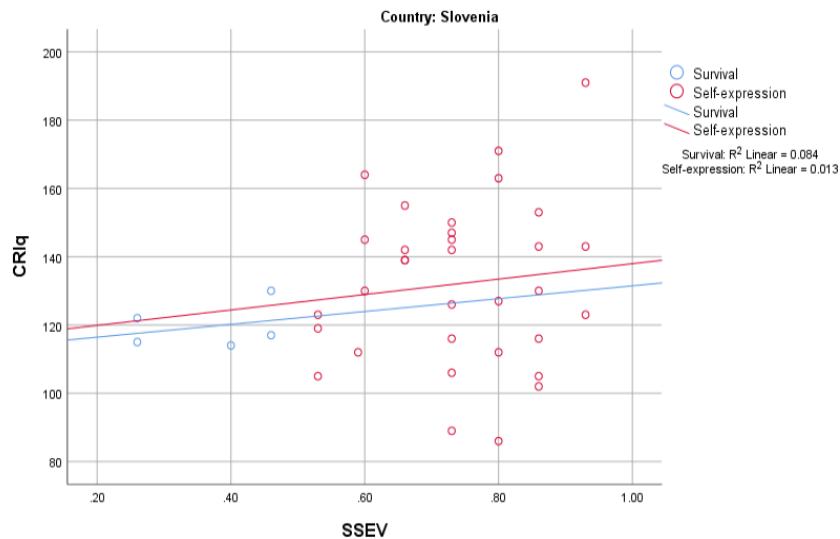


Figure 11. Scatter dot plot representation of the effects of SSEV on the CRIq score for participants from Slovenia.

Results from the regression analysis are displayed in Table 7, where we can see that SSEV is not a significant predictor for CRIq in either of the samples. We further substituted CRI_Education, CRI_Work and CRI_Leisure in place of the dependent variable, while keeping SSEV as the only predictor. These models also proved non-significant for both the North Macedonian and Slovenian sample.

Table 7. Predictor values (β) of linear regression analysis with the CRIq and its segments (education, work, and leisure) as dependent variables.

North Macedonia		Slovenia	
CRIq		CRIq	
Predictor	β	Predictor	β
SSEV	0.089	SSEV	0.189
R ² = 0.008		R ² = 0.008	
CRI_Education		CRI_Education	
Predictor	β	Predictor	β
SSEV	-0.042	SSEV	0.136
R ² = 0.002		R ² = 0.019	
CRI_Work		CRI_Work	
Predictor	β	Predictor	β
SSEV	-0.149	SSEV	0.094
R ² = 0.022		R ² = 0.009	
CRI_Leisure		CRI_Leisure	
Predictor	β	Predictor	β
SSEV	0.119	SSEV	.282
R ² = 0.039		R ² = 0.080	

5. DISCUSSION AND CONCLUSIONS

This study aimed to explore cultural values (SSEV) as predictors of cognitive reserve (CRIq) and cognitive performance (Auto-GEMS) in healthy older adults coming from Slovenia, and North Macedonia. It was hypothesised that greater prioritisation of self-expression values will be associated with better CRIq and Auto-GEMS scores, especially in a cultural unit where these values are predominant, like Slovenia. The opposite reasoning was applied for prioritisation of survival values typical for a developing country like North Macedonia. Furthermore, as a variety of studies have proven the positive predictive value of cognitive reserve on cognitive performance (Mondini et al., 2022; Nogueira et al., 2022; Nucci et al., 2012; Stern et al., 2019), this hypothesis was also examined in the study for each of the samples.

Before diving into analysis, it is important to go over the fact that both samples in this study followed their national trends from WVS wave 4 (1999-2004) and wave 7 (2017-2022). Namely, in alignment with WVS longitudinal data, participants from Slovenia exhibited more self-expression values, compared to participants from North Macedonia, which relatively prioritised survival values (see Table 3 and Figure 7). This also confirmed the isomorphic nature of the SSEV scale, thus avoiding ecological fallacy of generalising national-level data in cross-cultural research (Broesch et al., 2020; Vijver et al., 2015). According to several researchers (Inglehart & Welzel, 2005; Tabellini, 2010) the present study replicated such consistent results because scarcity and existential insecurity significantly influence how individuals and populations prioritise values. Decades long discrepancies between Slovenia and North Macedonia in terms of poverty risk, food insecurity (see Figure 5 and Appendix 3), corruption and modernisation (see chapter 2.2.1.) have shaped certain aspects of culture and made it more likely for individuals from North Macedonia to focus on survival values, as compared to the emphasis on self-expression values in Slovenia.

Hence, it was expected that social, lifestyle, and socio-economic factors, which reflect in prioritising survival or self-expression values, would be valid predictors of an individual's cognitive reserve and cognitive performance score (Lenart-Bugla et al., 2022; Quesque et al., 2020). However, overall statistical analysis revealed that cultural values were not a significant predictor of cognitive reserve, or each of its segments (education, work,

leisure) in North Macedonia or Slovenia (see Table 7). One valid reason for these results is that CRIq scores were not significantly higher in Slovenia compared to North Macedonia as it was originally assumed. It may not be an objective representation of the two populations since snowball sampling is not completely random and gathers a group of individuals with low diversity (e.g. socioeconomic status which allows access to a computer and internet, as well as basic IT education). Moreover, self-administered computerised questionnaires, such as the CRIq version used in this study, always pose a risk of dishonest answers or lack of understanding for the question at hand, without the ability to ask for clarification at the moment of testing.

Moving on to cognitive performance, it is crucial to note that just like for the CRIq scores, there were no statistically significant differences in the Auto-GEMS scores between the samples. It is perhaps due to the small sample size, or non-representative sampling as discussed earlier. In any account, two multiple regression models were constructed to examine the predictors of cognitive performance. The first model consisted of all three segments of the CRIq (education, work, leisure), the total CRIq score, as well as the SSEV score. Results showed that this model in general was not significant in predicting cognitive performance for either of the samples (Table 6). These findings go against evidence from a variety of studies that have proven the positive predictive value of cognitive reserve on cognitive performance (Mondini et al., 2022; Nogueira et al., 2022; Nucci et al., 2012; Stern et al., 2019). Statistically, such results may have occurred due to the fact that some of the participants with high cognitive reserve performed poorly on the Auto-GEMS and vice versa. The latter can be explained by the fact that computerised cognitive performance examinations like Auto-GEMS might end up giving confounding results due to the computer proficiency of the subject (using the mouse, adjusting the volume for instructions, typing on the keyboard) rather than their objective cognitive ability, or cognitive reserve. This limitation is particularly strong in smaller samples, such as the ones in this study, because a small group of participants with contradictory data can significantly skew results.

Since numerous studies have linked education as a pivotal factor in predicting both cognitive reserve and cognitive performance (Avila et al., 2021; Lenart-Bugla et al., 2022; Nogueira et al., 2022) we tested a second model where years of education and SSEV are put as predictors of the Auto-GEMS score. This model was overall significant in

explaining the variance in cognitive performance in the sample from North Macedonia, but not in the sample from Slovenia (Table 6). Out of the two predictors, SSEV was significant, while schooling was not, underlining that neither of the variables were significant as independent predictors of cognitive performance outside of the model. Since results indicated a kind of dependency between the variables, it was examined whether the interaction between schooling and SSEV would be a better fit for explaining the Auto-GEMS score in the sample from North Macedonia. This approach proved significant, although its statistical power was slightly weaker compared to the second model. Nonetheless, regarding the sample from North Macedonia we can conclude that for participants who prioritised survival values, years of schooling had a weaker effect on the Auto-GEMS score, opposed to participants who prioritised self-expression values (Figure 8). Although not significant, in an attempt to visualise the second model from the Slovenian sample (Figure 9), it was clear why years of schooling or prioritisation of self-expression values had no impact on cognitive performance. To clarify, some individuals with more than 15 years of schooling had very high Auto-GEMS results, and others with the identical education level had very low scores. Same goes for the SSEV predictor, seeing that more than 80% (Table 3) of this small sample prioritised self-expression values, no effects were found.

We can assume that these results can be explained by the fact that the Slovenian sample is more homogeneous (less random) meaning that most of the participants share the same values and had obtained more years of education. Matter of fact, this can be expected, as national data during the years when the cohort of participants in this study were of school age (see Figure 4), Slovenians on average had obtained more years of education in comparison to Macedonians. Despite this discrepancy not being obvious today, we found out that participants from North Macedonia did have significantly less years of schooling compared to participants from Slovenia. Shifting our focus towards the homogeneity of values in the Slovenian sample from the present study, it can be understood as a result of non-random sampling, or a representation of longitudinal population level WVS data where Slovenia has had a hard shift towards self-expression values as developed country (see Chapter 2.3.). In comparison, North Macedonia is a country in ongoing development that is gradually moving towards self-expression values (Haerpfer et al., 2021; Inglehart,

2007), which is reflected in the national SSEV scores, as well as the SSEV scores from this study's sample being almost split between survival and self-expression (Table 3).

Discussing these results and comparing them to existing research has proven a difficult field to navigate since there is a substantial gap in literature when it comes to considering cultural values as significant predictors (Franzen et al., 2021). Among the various reasons comprehensively addressed in the introduction, there are two main ones - the difficulty to define two comparable cultural units, and the lack of quantitative, isomorphic measures for cultural values suitable for research related to cognitive reserve and/or cognitive function. Although country does not always equate to culture, the carefully chosen cultural units in the present study are similar in size, have low within-culture variability and large between-culture variability, which has been systematically described in Chapter 2.2.1. Furthermore, according to the authors of the SSEV scale, prioritisation of survival over self-expression values (or vice versa) reflects both high-level variables such as GDP per capita and healthcare conditions, as well as low-level variables like an individual's involvement in leisure activities, or sense of existential safety (Inglehart, 2007; Inglehart & Welzel, 2005), which are established correlates of cognitive reserve and cognitive performance (Prince et al., 2012; Valenzuela & Sachdev, 2007).

In terms of healthcare conditions and personal sense of existential safety, there are some unexpected comparisons between the two samples. One of the main reasons to understand the link between value prioritisation and cognition in different cultural units is to help design better strategies for improving brain health, lifestyle, and healthy ageing. That being said, it is surprising that even though Slovenia has an advantage over North Macedonia in healthy ageing programs which urge brain health awareness and cognitive screening as early as midlife, both countries have very low scores on their objective national strategy scorecards (refer to Chapter 2.1.1. and Table 1). It means that both in North Macedonia and Slovenia, real-world implementation of good practices is particularly low. Furthermore, given the fact that primary care physicians in Slovenia are trained and authorised to conduct basic cognitive screening examinations, unlike in North Macedonia, we wanted to check for any possible differences in test familiarity. We found out that in both samples, more than 70% of the participants in this study have never been subjected to neuropsychological examination, cognitive testing, or IQ testing (Table 3), which is most likely common for a group of healthy older adults regardless of country.

Although research points out that test familiarity might play a role in cognitive performance (Ames, 2022) , this hypothesis could not be reliably tested due to sort of a “floor effect”.

In summary, from the significant results found in this study we can conclude that prioritisation of survival versus self-expression values, combined with years of schooling can explain the variance in cognitive performance scores only in our sample of healthy older adults from North Macedonia. Namely, we found out that prioritisation of self-expression rather than survival values is a positive predictor of cognitive performance in the sample from North Macedonia, which becomes significant when years of schooling is added to the model, hence clarifying the dynamic and strength of this relationship. Moreover, the interaction between the two predictors showed that the impact of schooling is more pronounced for individuals from North Macedonia who prioritise self-expression values.

It only goes to show that concepts involved in the present research are deeply intertwined and there is great difficulty in determining objective causality and direction. Certain studies argue that lifestyle factors and education influence cognitive reserve, which then in turn has an effect on global cognitive functioning and cognitive assessment (Florida, 2004; Inglehart & Baker, 2000; Smith & Bond, 2022; Steel & Taras, 2010). Having cognitive reserve as a mediator between cultural values and cognitive performance would have been a solid model to explore in this study. Unfortunately, two of the key assumptions for a mediation analysis were not fulfilled, and those are significant linear regressions between the mediator (CRIq) and the dependent variable (Auto-GEMS), and the mediator and the predictor (SSEV). This brings us to the limitations, propositions for improvement and future goals regarding cross-cultural research in the field of neuropsychology.

As mentioned throughout the discussion, computerised and self-administered neuropsychological assessment tools/questionnaires are relatively new, and researchers have very little control over the testing environment and truthfulness of the participants. Furthermore, systematic random sampling would be beneficial for future research, as it is very important to examine the effects of gender, computer literacy, test familiarity and income. The current sample from Slovenia and North Macedonia combined was predominantly female, never subjected to any kind of neuropsychological assessment,

with basic technical literacy and access to a computer and internet (which naturally corresponds to a specific income group). Conceivably, having variety in these domains might give valuable insight into the predictors of cognitive reserve and cognitive performance in older adults coming from two distinct cultures. Lastly, it is important not to forget the general limitation of cross-cultural research. There is a risk that an unknown variable may affect both the independent and dependent variables, changing the observed relationship between them. Examples of such variables include educational level, response style or item bias (Ames, 2022). Because it is impossible to control for all unforeseen factors, cultural measurement and hypothesis testing should be seen as part of a larger, multidimensional system. Smith and Bond (2022) illustrated this complexity in Chart 1, showing that the "cultural context" is a complex system of interconnected elements that exert varying degrees of influence on individuals.

In conclusion, the present study bridges an overlooked gap in cross-cultural research by defining cultural units using objective indicators, measures, rather than assumes cultural values, but most importantly emphasises the need to integrate culture in the attempt to develop, understand and validate neuropsychological assessment tools and create healthy ageing programs fit for our rapidly developing societies.

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APPENDIX

Appendix 1 - Self-declaration question regarding inclusion criteria

Translations available below in English, Slovenian and Macedonian, respectively (coding values are displayed in brackets, where 0 means the subject fits inclusion criteria and 1 represents the opposite).

Self-declaration

I declare that I do not have any of the listed neurological, psychological, or other clinically diagnosed diseases and/or medical treatments, which can impact my cognitive processes (those are mental processes including perception, memory, attention, use of language and other).

Please read carefully and choose the appropriate answer on the list below.

- Please choose.... (999)
- Dementia (1)
- Parkinson disease (1)
- Chorea Huntington (1)
- Multiple Sclerosis (1)
- Epilepsy (1)
- Minor traumatic brain injury within last year (1)
- Major traumatic brain injury (lifetime) (1)
- Transient ischemic attack (TIA) within last year (1)
- Stroke (lifetime) (1)
- Delirium within last five year (1)
- Meningitis within last five year (1)
- Encephalitis within last five year (1)
- Hydrocephalus (1)
- Aphasia, apraxia, agnosia (1)
- Schizophrenia (1)

- Bipolar disorder (1)
- Major depression (1)
- ADHD (1)
- Personality disorders (1)
- Substance abuse (1)
- PTSD (1)
- OCD (1)
- Anorexia or bulimia nervosa (1)
- Treatment at intensive care unit within last five year (1)
- Current cancer treatment (1)
- None of the above.... (0)

Lastna izjava

Izjavljam, da nimam nobene od naštetih nevroloških, psiholoških ali ostalih klinično diagnosticiranih motenj in/ali medicinskih terapij, ki lahko vplivajo na delovanje mojih kognitivnih procesov (to so mentalni procesi, ki zajemajo zaznavo, spomin, pozornost, uporabo jezika itd.).

Prosimo, da pozorno preberete in izberete ustrezen odgovor na spodnjem seznamu.

- Prosimo izberite.... (999)
- Demenca (1)
- Parkinsonova bolezen (1)
- Huntingtonova bolezen (1)
- Multipla skleroza (1)
- Epilepsija (1)
- Blažja travmatska poškodba možganov (pretres možganov v preteklem letu) (1)
- Težka travmatska poškodba možganov (1)
- Prehodni ishemični napad (v preteklem letu) (1)
- Možganski kap (1)
- Delirij (v preteklih petih letih) (1)
- Meningitis (v preteklih petih letih) (1)

- Encefalitis (v preteklih petih letih) (1)
- Hidrocefalus (1)
- Afazija, apraksija, agnozija (1)
- Shizofrenija (1)
- Bipolarna motnja (1)
- Depresija (1)
- ADHD (1)
- Osebnostna motnja (1)
- Zloraba substanc in/ali alkohola (1)
- Post-travmatska stresna motnja (1)
- Obsesivno-kompulzivna motnja (1)
- Anoreksija ali bulimija (1)
- Zdravljenje in opazovanje na oddelku za intenzivno nego (v preteklih petih letih) (1)
- Trenutno zdravljenje raka (1)
- Nič od naštetega.... (0)

Самодекларација

Изјавувам дека немам ни една од наведените невролошки, психолошки или други дијагностицирани клинички состојби и/или медицински терапии кои можат да влијаат на моите когнитивни процеси (тоа се ментални процеси кои вклучуваат перцепција, меморија, внимание, употреба на јазик итн.)

Внимателно прочитајте и изберете од листата подолу.

- Ве молиме изберете.... (999)
- Деменција (1)
- Паркинсонова болест (1)
- Хантингтонова болест (1)
- Мултиплекс склероза (1)
- Епилепсија (1)
- Блага трауматска повреда на мозок (потрес на мозок во изминатата година) (1)
- Сериозна трауматска повреда на мозок (1)

- Транзиторен исхемичен напад (во изминатата година) (1)
- Мозочен удар (1)
- Делириум (во изминатите пет години) (1)
- Менингитис (во изминатите пет години) (1)
- Енцефалитис (во изминатите пет години) (1)
- Хидроцефалус (1)
- Афазија, апраксија, агнозија (1)
- Шизофренија (1)
- Биполарно растројство (1)
- Депресија (1)
- ADHD (1)
- Растројство на личноста (1)
- Прекумерно уживање на супстанции и/или алкохол (1)
- Посттрауматско стресно растројство (1)
- Опсесивно-компулзивно растројство (1)
- Анорексија или булимија (1)
- Лекување и престој на оддел за интензивна нега во текот на изминатите пет години (1)
- Тековно лекување на карцином (1)
- Ниедно од наведените.... (0)

Appendix 2 - Two dimensions of Cross-cultural variation

Source: Inglehart and Welzel (2005, p. 49, 51)

TABLE 2.1. *Two Dimensions of Cross-Cultural Variation: Aggregate-Level Analysis*

	Factor Loadings
Traditional values emphasize the following (Secular-rational values emphasize the opposite): ^a	
God is very important in respondent's life.	.91
It is more important for a child to learn obedience and religious faith than independence and determination. (Autonomy index)	.88
Abortion is never justifiable.	.82
Respondent has strong sense of national pride.	.81
Respondent favors more respect for authority.	.73
Survival values emphasize the following (Self-expression values emphasize the opposite): ^b	
Respondent gives priority to economic and physical security over self-expression and quality of life. (4-item Materialist/Postmaterialist Values Index)	.87
Respondent describes self as not very happy.	.81
Homosexuality is never justifiable.	.77
Respondent has not and would not sign a petition.	.74
You have to be very careful about trusting people.	.46

Note: The original polarities vary; the above statements show how each item relates to the given factor (factors = 2, varimax rotation, listwise deletion).

^a This first factor explains 46 percent of total cross-national variation; secular = positive pole.

^b This second factor explains 25 percent of total cross-national variation; self-expression = positive pole.

Source: World Values Survey data from more than 200 surveys carried out in four waves in 78 societies.

TABLE 2.2. *Two Dimensions of Cross-Cultural Variation: Individual-Level Analysis*

	Factor Loadings
Traditional values emphasize the following (Secular-rational values emphasize the opposite): ^a	
God is very important in respondent's life.	.70
It is more important for a child to learn obedience and religious faith than independence and determination. (Autonomy index)	.61
Abortion is never justifiable.	.61
Respondent has strong sense of national pride.	.60
Respondent favors more respect for authority.	.51
Survival values emphasize the following (Self-expression values emphasize the opposite): ^b	
Respondent gives priority to economic and physical security over self expression and quality of life. (4-item Materialist/Postmaterialist Values Index)	.59
Respondent describes self as not very happy.	.59
Homosexuality is never justifiable.	.58
Respondent has not and would not sign a petition	.54
You have to be very careful about trusting people.	.44

Note: The original polarities vary; the above statements show how each item relates to the given factor. Total N = 165,594; smallest N for any of the above variables is 146,789.

^a First factor explains 26 percent of total individual variation; secular = positive pole.

^b Second factor explains 13 percent of total individual variation; self-expression = positive pole.

Source: World Values Survey data from 125 surveys carried out in three waves in 65 societies.

Appendix 2.1 - Correlates of Survival versus Self-expression Values index

Source: Inglehart and Welzel (2005, p. 55, 56)

	Correlation with Survival/ Self-Expression Values ^a
Survival values emphasize the following	
(Self-expression values emphasize the opposite):	
Men make better political leaders than women.	.86
Respondent is dissatisfied with financial situation of his or her household.	.83
A woman has to have children in order to be fulfilled.	.83
Respondent rejects foreigners, homosexuals, and people with AIDS as neighbors.	.81
Respondent favors more emphasis on the development of technology.	.78
Respondent has not recycled things to protect the environment.	.78
Respondent has not attended a meeting or signed a petition to protect the environment.	.75
When seeking a job, a good income and safe job are more important than a feeling of accomplishment and working with people you like.	.74
Respondent is relatively favorable to state ownership of business and industry.	.74
A child needs a home with both a father and a mother to grow up happily.	.73
Respondent does not describe own health as very good.	.73
One must always love and respect one's parents regardless of their behavior.	.71
When jobs are scarce, men have more right to a job than women.	.69
Prostitution is never justifiable.	.69
Government should take more responsibility to ensure that everyone is provided for.	.68
Respondent does not have much free choice or control over his or her life.	.67
A university education is more important for a boy than for a girl.	.67
Respondent does not favor less emphasis on money and material possessions.	.66
Respondent rejects people with criminal records as neighbors.	.66
Respondent rejects heavy drinkers as neighbors.	.65
Hard work is one of the most important things to teach a child.	.64
Imagination is <i>not</i> one of the most important things to teach a child.	.62

	Correlation with Survival/ Self-Expression Values ^a
Tolerance and respect for others are <i>not</i> the most important things to teach a child.	.62
Scientific discoveries will help, rather than harm, humanity.	.60
Leisure is not very important in life.	.60
Friends are not very important in life.	.58
Having a strong leader who does not have to bother with parliament and elections would be a good form of government.	.56
Respondent has not and would not take part in a boycott.	.56
Government ownership of business and industry should be increased.	.55
Democracy is not necessarily the best form of government.	.45
Respondent opposes sending economic aid to poorer countries.	.42

^a The number shows how strongly each variable is correlated with the survival/self-expression values index. The original polarities vary; the statements show how each item relates to the traditional/secular-rational values index.

Source: Nation-level data from 65 societies surveyed in the 1990 and 1996 World Values Surveys.

Appendix 3 – Percentage of households with children unable to afford a decent meal

