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The Digital Divide and the Elderly: How Urban and Rural Realities Shape Well-Being and Social Inclusion in the Sardinian Context

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Abstract: The Digital Grey Divide (DGD) is a phenomenon that refers to the digital inequality existing among the elderly in using digital tools. DGD could generate social exclusion and hinder elderly well-being because today many aspects of life are online. The objective of the research is to compare the urban and rural group to see if a digital divide is present and whether psychological and cognitive well-being can be predictors of usage. The research involved 100 elderly people (belonging to two different areas: one rural and one urban) aged 65 to 90 (M = 72.3; SD = 6.4) with intact cognitive functioning investigated by the MMSE test. A socio-anagraphic module to investigate digital use (DU), a questionnaire on cognitive reserve (CRIq), and a questionnaire investigating well-being (Ben-SSC) were administered. Results showed that the two groups differ in terms of access and use of digital tools ($F = 28.34$, $p < 0.001$), with the urban group reporting higher levels of access and use. Moreover, in the urban group, psychological well-being has an inverse relationship with digital, while in the rural group, the relationship between cognitive well-being and use is direct. Therefore, the study aims to highlight how even in developed countries there can be a digital divide (DD) given the risks of exclusion, particularly for the elderly population. For all these reasons, it is necessary to pursue interventions to achieve a higher level of digitalization and sustainable development among the population. Given the importance of this phenomenon, it is necessary to address the issue of DD in various spheres of life: political, social, economic and care.

Keywords: Digital Grey Divide; well-being; cognitive reserve; digital exclusion; predictors of digital usage; sustainability

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1. Introduction

In recent years, digital products and technology use have rapidly spread across populations, significantly transforming various aspects of life [1]. However, not everyone has been equally engaged in this swift technological advancement [2].

This disparity is commonly referred to in the literature as the digital divide (DD). Prensky (2001) categorized individuals into two groups: digital natives, who have grown up immersed in technology, and digital immigrants, who have had to adapt to technological developments, often struggling to keep up with the pace of progress [3].

The DD can arise from various factors [4,5] although this distinction between the parties is not always clear-cut [6]. The current conceptualization classifies the DD into three

levels. The first-level gap refers to the lack of physical and material access to digital tools [7]. Geographical characteristics influence this aspect, there is a clear difference between developed and developing countries due to underdeveloped infrastructure that does not allow high-speed Internet and there is limited broadband adoption [8,9]. Similar inequalities are evident within developed countries, manifesting between states, regions [4], and even between rural and urban areas within the same region [10]. An example of how these dynamics materialize can be seen in Italy, the country in which the research we will present was conducted, where the past 30 years have witnessed significant changes impacting communication, privacy, work, education, leisure, and sociocultural participation [11].

Despite this, Italy still faces infrastructural delays in network development and notable socio-demographic disparities. Access is higher in the central and northern regions compared to the southern and insular areas [11–13]. The second level of DD is called the utilization gap [14,15] and takes into consideration the motivations and skills that drive the user to have and use digital tools. Imbalances between factors such as inequalities in means, goals, autonomy, skills, and support can affect the digital usage gap [4]. The third level of the digital divide is called the performance gap; it investigates the benefits that can be had because of technology use [16].

As technology advances, research may uncover new dimensions of DD [17]. For example, the factor "age" has become a key factor influencing DD over time, giving rise to the concept of the Digital Grey Divide (DGD)—a phenomenon highlighting digital inequality among the elderly or in comparisons between older and younger generations [1].

2. The Present Study

In light of the extensive body of research on the digital divide (DD) and the profound effects this phenomenon can have on individuals and society, this study aims to delve deeper into the concept of the Digital Grey Divide (DGD) in the Italian context and in particular in the Sardinian region. Studying the digital divide in Sardinia is important for several reasons, especially considering the specificities of the island and the challenges it faces. Although not completely, this region mirrors some critical issues in other parts of Italy, mainly characterized by a risk of depopulation and growth in the number of elderly people. By examining the potential risks of DGD, particularly in the long term, the research seeks to highlight the challenges that arise as technology continues to advance, and the elderly population faces an ever-widening gap in terms of digital access and usage. The long-term consequences of DGD can be far-reaching, not only affecting personal well-being but also contributing to social exclusion and isolation among older adults who struggle to keep pace with the digital age. This study will begin by providing a snapshot of the current reality, analyzing the presence and impact of DGD across two distinct environments—urban and rural settings. By comparing these two contexts, the research aims to explore the varying levels of access to technology and digital tools and to identify the specific repercussions these disparities may have on older individuals' quality of life. In particular, the study will focus on how DGD is linked to the physical, mental, and emotional well-being of elderly individuals, as well as the extent to which it might lead to social isolation or exclusion from community life and essential services. As a pilot study, this research is being conducted in a unique geographic area characterized by both a strong culture of well-being and longevity, as well as a marked trend of depopulation. These distinctive features provide a valuable opportunity to investigate how DGD intersects with factors like population density, social engagement, and the availability of digital services. The contrast between rural and urban areas will shed light on how the digital divide manifests differently in regions with varying levels of technological infrastructure and socio-economic development. Moreover, the focus on an area known for its high levels of longevity encourages further exploration of whether

digital inclusion can play a role in maintaining or improving the quality of life for older adults. This study also considers the broader implications of digital technology in modern life. In today's world, the digital landscape is no longer just a means of communication but it is deeply integrated into everyday activities such as accessing essential services. The COVID-19 pandemic, in particular, has underscored the crucial role of technology, as social distancing measures and lockdowns necessitated a shift toward digital solutions in nearly every aspect of daily life. Digital tools became indispensable for navigating the challenges of the pandemic, particularly for vulnerable populations, including the elderly. This context highlights the urgency of addressing DGD, as it directly impacts the ability of older individuals to access services and maintain social connections during times of crisis. As technology becomes increasingly integral to society, it is imperative to consider how the elderly population, many of whom are not digital natives, can be supported in adapting to this new reality. The study aims to examine the specific needs of this demographic, identifying the barriers to digital inclusion in order to give valuable insights to policy makers, community leaders, and social service organizations working to create a more inclusive and equitable digital future for all generations.

2.1. Old Age

Old age has a formal beginning from the age of 65, referring to working life and the time of retirement, a time that implies changes in a person's life [18]. Aging is a natural condition; it is inscribed in the genetic heritage, but the way in which one can grow old is influenced by various factors: educational–cultural, experiential, and learning. Thus, the context is related to the quality of life in old age [19], and contrary to what was believed in the past, it does not imply a process of loss and decline [20] but is probabilistic, multidimensional, characterized by plasticity [21], and influenced by various factors [22,23], like any stage of life [24]. Embracing this perspective can include the possibility of going through active or successful aging, in which opportunities for health, participation and well-being in old age are maximized, a concept that goes far beyond the absence of disease [25]. In this regard, some scholars have become interested in Blue Zones [26], specific areas where there are cases of longevity and healthy aging, accumulated by geo-morphological isolation and well-being not explained by socioeconomic status. People who grew up in these areas report high levels of personal satisfaction and good coping and emotional strategies. The elderly, moreover, are considered an important part of the community and play an active role in it, entertain themselves in religious and creative activities that influence cognitive functioning, have a lower likelihood of incurring cognitive failures and compensate for low levels of education [27].

2.2. The Concept of Well-Being in Old Age

The search for a definition of well-being has ancient origins, tracing back to Greek philosophers [28]. In modern times, one prominent perspective is hedonic well-being, which focuses on the pursuit of pleasure and the avoidance of pain, considering happiness as the ultimate goal of human action. As people age, they tend to prioritize positive emotions, a concept explained by Carstensen's socioemotional selectivity theory [29–31]. This theory posits that older individuals have an increasingly narrow, limited view of time, and by virtue of this, they shift their goals in relationships, moving from wanting to expand their knowledge to the need to maximize effective potential. The elderly often prefer to strengthen intimate connections over expanding social networks [31,32].

Hedonic well-being, while valuable, is often contrasted with eudaimonic well-being, which views happiness as the pursuit of a meaningful life. This deeper view, inspired by Aristotle, emphasizes personal growth, the fulfillment of one's potential, and the exercise

of reason. Ryff's model [30] of eudaimonic well-being identifies six key components: self-acceptance, autonomy, environmental mastery, positive relationships, life purpose, and personal growth. According to this model, well-being extends beyond happiness to include a sense of development and contribution to the community, making it particularly relevant for older adults. The use of this model focuses on increasing personal well-being by enhancing coping strategies, promoting resilience and optimism, and supporting emotional regulation [33].

Therefore, psychological well-being appears to be a significant protective factor that plays an important role in the health of the elderly. Factors that can influence well-being include the ability to recognize change and worsening of one's psychophysical condition, bereavement, and impending impossibilities [34]. Life satisfaction, gratitude, the ability to learn new things, and a positive outlook on life are among the factors of positive aging [35]. Environmental factors also have their weight and influence. The ability to actively participate in social life and keep physically active. The use of social media, taking time for oneself, having hobbies, interests and playing sports. Cultivating social relationships and creating a support network around oneself [36], which includes having a good family, neighborhood, marital and even a good relationship with one's doctor [34]. Furthermore, spiritual strength, mental health, and independence support elderly individuals' resilience [35].

2.3. The Relationship Between Well-Being and Cognitive Reserve in Old Age

Independence, good mental health, and mental and physical functioning are protective factors in old age [34]. Quality of life has been found to be cognitively associated with high levels of cognitive reserve [37]. The generic term reserve refers to the brain's ability to recover from damage or injury [38]. Cognitive reserve is an active model, does not assume a fixed threshold [39], and focuses on the processes that allow an individual to sustain brain damage while maintaining good functioning. The individual with higher cognitive reserve tolerates damage better. In fact, this model considers several aspects: differences in resource use, the individual's active role in cognitive maintenance, and the influence of environment and experience [40]. Indeed, a healthy lifestyle, practicing physical activity, and engaging in midlife activities, whether social or intellectual, are activities and experiences that correlate with high levels of cognitive reserve and greater benefits in aging [41,42]. Overall, studies seem to agree that higher levels of cognitive reserve are associated with lower levels of risk in the onset of mild cognitive impairment (MCI) [43], along with better cognitive performance [40].

Consistent with these assumptions, a lower level of performance on cognitive reserve is associated with lower levels of both physical and psychological well-being [44]. Recent work has focused on the relationship between cognition and well-being in development, finding that these two variables are coupled longitudinally and crosswise over time, showing a bidirectional relationship specific and complex for some domains of cognition, resulting in different trajectories depending on events and stimulations over the life course [45]. To investigate the elderly population, longitudinal studies including several cohorts were conducted in which many aspects of well-being were positively associated with levels of cognitive functioning [46]. High levels of life satisfaction were associated with better outcomes in the physical health domain, finding reduced mortality, pain, limitations, and disease; and in the psychosocial domain, finding increased positive affect, satisfaction, optimism, and mastery [47]. Having a purpose in life, defined through intentions and goals, is a protective factor for cognitive functioning by acting preventively against cognitive decline [48].

2.4. The Relationship Between DGD, Well-Being, Cognitive Reserve and Social Exclusion in Old Age

Research investigates what factors can determine well-being and longevity [49], considering today's digitized world, the role that technology can play in the elderly's quality of life is also investigated [50]. Gerontechnology, it has expanded over the years as multidimensional research with the intent of ensuring a better quality of life [51]. As of today, there are many digital tools that are useful to the elderly person [52], which could improve quality of life, lead to greater care and enable greater independence [51], but not all elderly people accept gerontechnology in their lives. It turns out, in fact, to be able to improve both physical and mental health and act positively on cognitive functioning [53], above all on cognitive reserve, and brain plasticity. In fact, cognitive reserve can be positively affected by technology use. High levels of cognitive reserve may prevent cognitive decline [54] and decrease subjective cognitive concerns [55]. The levels of cognitive reserve and the benefits of using technology differ depending on the use of technology, so using digital tools for many purposes and not only for communication purposes brings greater benefits to the cognitive level [56]. Computer and Internet use require some motor and cognitive skills [53] and are associated with neuroplasticity [57]. Technologies are tools that can make some everyday issues easier for us, which is why they could have consequences for cognition [53]. High levels of cognitive reserve are associated with the effectiveness of change in older people and promote the development of adaptive behaviors [58]. Therefore, apps [59], games, and software have been developed to foster cognitive abilities in the elderly [60]. The meta-analysis by Leung and colleagues [61] show that computerized cognitive training has effects on memory, visuospatial, and attentional skills [62], processing speed, executive functions [61], and reasoning ability [63–65]. New technologies can support the maintenance of social relationships [66,67]. The use of information and communication technologies can have positive effects on the psychological well-being of older adults aged 75 years and older, particularly when they are frail and maintain contact with family [68]. For these reasons, technology and its use may emerge as a possible factor capable of determining successful aging [69], positively impacting emotionality, sociality, and life satisfaction [70]. Older adults who use the Internet report lower levels of social loneliness due to computer-mediated support that allows interaction with others [71]. The elderly population already experienced high levels of loneliness before the pandemic, which increased as social distancing measures were adopted [72]. The ability to use technologies to adapt to difficult situations, such as the pandemic situation due to COVID-19, was found to be a protective factor against loneliness, leading to its decrease [73]. Online communities have offered several benefits to older participants [74].

Despite the role that digital can play in everyday life and the benefits it could bring even in old age; the elderly group has the least access to digital tools [67]. The reasons that hinder older people in their relationship with technologies can be different [75]: sociodemographic barriers such as income and education [76], health conditions [77], physical and cognitive barriers [78–80], digital skills possessed [81], familiarity with digital tools in their context [82], and whether that context is supportive [5] or instead embraces an ageist perspective, negatively affecting the elderly user's relationship with technology [83]. The digital divide results in social exclusion and a range of disadvantages due to various factors such as low income, low levels of schooling, ethnicity, social class of membership and the various possible combinations among these factors [1], as Van Dijk points out in the circular model [15]. Therefore, individuals with higher digital engagement and functioning participate more in digital life and have greater benefits [15], as different aspects of life affect digital wellbeing [84]. The elderly, in developed countries, have the resources to access technologies but taking advantage of them requires a high level of education [85].

The pandemic situation due to the COVID-19 virus showed how inadequate infrastructure and large-scale events can exacerbate already existing digital divides [4,17], forcing many countries to change health care systems and take advantage of telematics assistance to which not everyone had access, among them the elderly [86], despite increased technology use during the pandemic period [72]. Therefore, digital exclusion represents a double danger of social exclusion for the elderly segment of the population, which may already be partly isolated due to age [66]. It is of paramount importance to consider this aspect in a comprehensive way, taking into consideration not only the positive aspects due to access but also acting preventively on the risks one might have due to not having access to such tools.

2.5. Aims of the Study

Therefore, given the current research review, this study aimed to investigate the digital divide in the Sardinian elderly population by comparing two different realities: a rural reality belonging to the Blue Zones, areas characterized by successful longevity and aging, and an urban reality.

H1. *We want to test whether digital use is more present in rural than in urban areas. Given the literature [4,10,82], we hypothesize lower digital use and digital self-efficacy by the rural group than the urban group.*

H2. *We hypothesize that the rural group differs from the urban group in characteristics attributable to successful aging that are typical of the Blue Zone, in particular, high levels of perceived psychological well-being and good overall cognitive functioning [26,27].*

H3. *We hypothesize that psychological and cognitive well-being are correlated with digital use differently in the two groups.*

H4. *Considering the literature on the possible risks due to digital exclusion [15] and the possible benefits due to use [51,52,56], we ask whether psychological and cognitive well-being may be predictors of digital use.*

3. Materials and Methods

3.1. Procedure

Participants were recruited through voluntary participation, ensuring anonymity and data privacy. We employed a non-probabilistic sampling strategy, specifically snowball sampling. This approach was chosen due to the difficulty of accessing the target population. Participants were recruited through a voluntary membership process, facilitated by a project sponsorship campaign. This campaign involved a presentation of the project by two seminars. The initial pool of potential participants consisted of 200 participants. However, due to the nature of snowball sampling, we did not have access to a predefined sampling frame, except for the characteristics of the sample in the specific areas to be examined. As for the urban group, the possibility of presenting the project at the University of the Third Age, located in Quartu (UNI3), was requested in order to encourage voluntary participation of the interested parties. For this group, the administration took place at the UNI3 headquarters, in paper form, in the period from December 2023 to January 2024. The recruitment of the rural group was possible through word of mouth with the project presentation. Also in this case, the experimenter administered the paper questionnaires through a face-to-face mode. The administration took place at the home of the voluntary participants, in paper form and in a quiet and private area of the house, covering the entire month of November 2023. The questionnaires were administered by licensed researchers/psychologists who

were trained in the tests used. They were asked to view and sign the informed consent, which set out the intentions and conditions of the research. Participants were informed of the purpose of the research, its duration and data processing. Once consent for participation in the study was obtained, the inclusion criteria were checked:

(1) Be age 65 or older, conventionally considered to be the beginning of senile age following retirement [18];
(2) Having reported an adjusted score on the Mini Mental State Examination MMSE test equal to or greater than 24. Once the inclusion of the participant in the research was established, the instruments were administered after specific training on the subject.

3.2. Measures

3.2.1. Sociodemographic Form

Participants first filled out a sociodemographic form to collect parameters such as gender, age, marital status, region and province of residence, educational qualification, and current and past profession. The form was also useful for investigating digital use. In particular, participants were asked whether or not they own a cell phone, smartphone phone, or personal computer, whether they use digital tools and whether they do so independently. They were asked how many hours they spend online, what devices they use to browse, and what activities they do, asking them to self-assess themselves via a Likert scale of 1 to 5.

3.2.2. Self-Efficacy in Digital Use Scale

Participants were asked to indicate via a 10-point Likert scale how well they felt able to use the digital tools available to them.

3.2.3. Mini Mental State Examination [87]

The Mini Mental State Examination [87] is a widely used instrument to assess cognitive function and detect cognitive deficits; an Italian validation was used [88]. In this study, we have used the Italian version. This test focuses on six main areas of cognition: spatio-temporal orientation, attention and computation, short-term memory and recall, task performance, and language, which includes comprehension, repetition, naming, reading and writing. The MMSE comprises 19 items, each scored with a binary score: 0 for incorrect answers and 1 for correct answers. The total score can range from a minimum of zero to a maximum of 30 points, where higher values indicate better cognitive function. Usually, a score between 24 and 30 is considered indicative of normal cognition, while lower values may suggest cognitive impairment of varying degrees.

3.2.4. Cognitive Reserve Index (CRIq) [89]

The Cognitive Reserve Index (CRIq) [89] is a questionnaire that investigates cognitive reserve through a collection of questions covering the individual's entire life. To take the questionnaire, the respondent must be cognitively intact. If there is even the slightest doubt of a memory or attention deficit, it would be preferable to administer the test to a familiar person who is familiar with the respondent's habits. The test is divided into four sections:

The CRI-q-school (CRI_S) surveys the level of schooling and considers years of schooling, including repeated years, and courses taken even outside of school.

The CRI-q-work (CRI_W) investigates occupation and work activities performed over a lifetime. The various occupations are placed along a vertical that determines the degree of complexity and responsibility held by each job description.

The CRI-q-free time (CRI_FT) investigates leisure activities, which in turn are divided into weekly, monthly, annual and fixed-frequency activities.

The CRI-q-tot (CRI_Tot) is the final questionnaire score corresponding to the average of the three indices transposed on a scale with a mean of 100 and a standard deviation of 15. In each section, an attempt is made to establish which activities the subject rarely carries out and which activities they carry out with some regularity; in the latter case, it is important to know for how many years. In this way, each subject's CRI score is estimated based on their age.

3.2.5. Ben-SSC [90]

The questionnaire Ben-SSC created by De Beni and colleagues [90] assesses the well-being of the elderly based on the eudaimonic well-being model [30]. It consists of 37 items and the participant is asked to judge how close each proposed statement is to how they feel. Responses are attributed via a four-point Likert scale, ranging from "Never", "Sometimes", "Often", and "Always".

Three factors are investigated in the questionnaire:

- Personal satisfaction (BenSP) investigates past, present and future life considering positive and negative aspects.
- Coping strategies (BenSC) investigating self-efficacy, autonomy and independence.
- Emotional competence (BenCE) refers to the ability to recognize one's own and others' emotional state.

Finally, the total well-being score (BenTOT) is calculated by summing the items representing the three factors and the items not included in them, which can reach a maximum of 148 points. For this questionnaire, self-completion was always favored, except in cases where the subject had reading difficulties, in order to avoid the answers being influenced by the presence of the interviewer. In our research, Cronbach's alpha for the overall Ben-SSC scale was 0.922.

3.3. Sample

A total of 104 elderly people took part in the research. Of these, participants with an adjusted Mini Mental State Examination [91] score of 24 or lower were excised. Therefore, 100 elderly participants were included.

3.4. Data Analysis

In the initial phase, we analyzed the study variables to evaluate the distribution of the data.

Descriptive data analyses, including means, standard deviations, and frequencies, were performed. To investigate differences in rural and urban groups, a *t*-test was conducted. Bravais–Pearson's linear correlation was used to examine the relationships among variables. We conducted an a priori power analysis to calculate the appropriate sample size for detecting differences in means. Assuming a large effect size (f = 0.40), an alpha level of 0.05, and a desired power of 0.80, the analysis indicated that a minimum of 52 participants would be required. Furthermore, for the regression analysis with a predictor under the same assumptions of large effect size (i.e., f-squared = 0.35), alpha level, and power, a minimum of 66 participants would be necessary. Data was analyzed using software, Jamovi 2.3 [91], and G*Power 3.1 [92].

4. Results

4.1. Descriptive Statistics

A total of 100 participants aged 65 to 90 (M = 72.3 $\pm$ 6.4) years were included in the present study. The sample shows good cognitive functioning (M = 26.6; SD = 1.34). The sample is not balanced for gender, as it has 33 male and 67 female participants. Participation

in the research drew subjects from two different provinces in Sardinia. Of the province of Nuoro, 40% of the sample belonged to the province of Nuoro, and the survey focused on some small rural centers such as Fonni, a small town of less than 4000 inhabitants.

The remaining 60% were from the province of Cagliari, and the survey was conducted at the University of the Third Age in Quartu, an urban center with a population of about 70,000; the participants were mostly residents of Quartu and Cagliari.

The sample can be divided into two groups according to the province of residence, whereby the urban group is the one from the province of Cagliari, while the group from the province of Nuoro is the rural group. The descriptives of the two groups are shown in Table 1.

Table 1. The descriptives of the two groups. The residence variable refers to the place of residence, divided into two groups: rural and urban.

		Residence	Mean	Standard Deviation	Frequencies
Age		rural urban	75.80 70.03	6.84 4.92	
MMSE		rural urban	26.33 26.83	1.60 1.09	
Gender		rural			Male = 16 Female = 24
		urban			Male = 17 Female = 43
Civil Status	single	rural urban			6 4
	conjugate	rural urban			24 36
	divorced/separated	rural urban			0 10
	widower/widow	rural urban			10 10
Who do you live with?	alone	rural urban			9 19
	with spouse/cohabiting partner	rural urban			12 31
	with spouse/cohabiting partner and children	rural urban			10 6
	only with children	rural urban			3 4
	more	rural urban			6 0
Qualification	no qualification	rural urban			2 0
	primary school licence	rural urban			16 0
	lower secondary school	rural urban			18 10
	secondary school	rural urban			3 32
	degree	rural urban			1 17
	post-graduate	rural urban			0 1

Participants were asked about the use of their own digital tools. Of the rural group, 32 participants own a mobile phone, 25 a smartphone phone, 11 a personal computer and 23 an Internet connection. As for the urban group, 53 participants own a mobile phone, 59 a smartphone phone and an Internet connection and 54 a personal computer. In total, 73% of the urban group make use of digital tools and 75% do so independently. Of the rural group, only 27% make use of digital tools and 25% do so independently.

In relation to the time of use, the rural group spends an average of 1.5 h per day online on Monday to Friday, while spending a lower average, albeit slightly, on holidays. The urban group spends an average of almost 3 h per day online on Monday to Friday, while spending 2 h on holidays. Possible online activities were also investigated, such as social networks, online shopping, payment and banking services, TV series, online chats and/or calls, forums, virtual worlds, online games, e-mail and online booking services. The urban group reports more varied uses than the urban group.

Psychological well-being was measured through the Ben-SSC questionnaire [49] and divided into several factors: personal satisfaction (Ben-PS), coping strategies (Ben-CS), and emotional competence (Ben-EC). The index of personal satisfaction and the index of coping strategies are evaluated according to age groups: participants aged 60 to 69 years, 70 to 79 years, and finally participants aged 80 years or older. In addition to being divided by age groups, the emotional competence index is also separated by gender (M: male; F: female).

The rural group reported a high total well-being index. The index of personal satisfaction and coping strategies is high for the 60–69 and 70–79 groups, while the 80+ group shows a medium level of personal satisfaction and a low level of coping strategies. The emotional competence index is high for the 60–69 and 70–79 groups, while the other groups show average levels.

The urban group reported an average total well-being index. The personal satisfaction index recorded average levels in the 60–69 and 70–79 groups, while the 80+ group reported low levels. The 60–69 and 70–79 groups reported high levels of coping strategies, while the 80+ group reported low levels. The 60–69 male group reported high levels of emotional competence; the 60–69 and 70–79 female groups, both genders, and the 80+ female-only group reported average levels of emotional competence; the 80+ male group reported low levels. Data are shown in Tables 2 and 3.

Table 2. Description of psychological well-being investigated through the Ben-SSC questionnaire [49], divided into several indices such as personal satisfaction (Ben-PS) coping strategies (Ben-CS) and total well-being (Ben-Tot).

	Residence	Age-Group	Ben-PS	Ben-CS	Ben-Tot
Mean	rural	60–69	37.33	27.00	121.32
		70–79	37.26	27.73	
		80+	39.75	27.08	
	urban	60–69	33.12	27.34	112.55
		70–79	33.90	27.27	
		80+	31.50	24.75	
Standard deviation	rural	60–69	4.87	3.96	13.92
		70–79	5.00	4.40	
		80+	3.69	5.38	
	urban	60–69	5.13	4.54	13.32
		70–79	4.92	2.58	
		80+	4.65	2.63	
Shapiro–Wilk *p*	rural	-	0.004	0.038	0.150
	urban		0.738	0.576	0.839

Table 3. Data related to the emotional competence index (Ben-EC) of psychological well-being investigated through the Ben-SSC questionnaire [49].

	Residence	Age-Group	Gender	Ben-EC
Mean	rural	60–69	F	32.25
			M	35.60
		70–79	F	30.90
			M	35.62
		80+	F	34.11
			M	32.66
	urban	60–69	F	31.23
			M	30.83
		70–79	F	29.33
			M	30.85
		80+	F	34.50
			M	27.50
Standard deviation	rural	60–69	F	2.63
			M	3.36
		70–79	F	5.14
			M	2.26
		80+	F	4.25
			M	6.42
	urban	60–69	F	4.75
			M	3.18
		70–79	F	4.36
			M	2.54
		80+	F	2.12
			M	2.12
Shapiro–Wilk *p*	rural			0.107
	urban			0.045

Cognitive reserve, as measured by the Cognitive Reserve Index questionnaire [92], identifies three indices: the "school" index (CRI_S), "work" index (CRI_W) and "free time" index (CRI_FT). Both groups report average levels of total cognitive reserve (CRI_Tot), as shown in Table 4.

Table 4. Described table of data concerning the cognitive reserve questionnaire: Cognitive Reserve Index [92].

	Residence	CRI_S	CRI_W	CRI_FT	CRI_Tot
Mean	rural	99.00	103.30	103.37	100.97
	urban	122.61	110.38	120.43	123.56
Standard Deviation	rural	10.09	14.35	16.19	10.77
	urban	16.98	18.16	21.71	18.35
Shapiro–Wilk *p*	rural	<0.001	0.197	0.920	0.887
	urban	0.005	0.153	0.276	0.340

4.2. Differences in Digital Use and Digital SE Among Groups

The statistical analysis in Table 5 shows significant differences between rural and urban users in the use or perception of technology. The Mann–Whitney U test, used to compare two independent groups, revealed that in all cases analyzed, the differences between the two categories are highly significant ($p < 0.001$). This means that the habits or perceptions of users in the two contexts are clearly different. One of the most striking aspects to emerge

from the data is that participants living in urban areas tend to have higher average scores than participants from rural areas. This is true for all devices analyzed (smartphones, tablets, PCs, smart TVs), suggesting that the urban population may have greater access to technology or a greater propensity to use it. The most pronounced differences occur for PCs and tablets. This means that the distinction between urban and rural users is particularly evident when it comes to these devices. Examining the descriptive data, shown in Table 6, results suggest that urban users interact with technology more frequently than their rural counterparts. Additionally, the greater variability in urban data may reflect a wider range of technology usage patterns, whereas behavior in rural areas appears to be more uniform.

Table 5. Mann–Whitney *t*-test for independent samples.

	U Statistic	*p*	Mean Difference	95% Confidence Interval		Effect Size (Rank Biserial Correlation)
				Lower	Upper	
mobile phone	501.00	<0.001	−1.0001	−1.0000	−1.0000	0.5825
tablet	818.00	0.001	−0.0000	−1.0000	−0.0000	0.3183
PC	408.00	<0.001	−1.0001	−1.0000	−1.0000	0.6600
smart TV	588.00	<0.001	−1.0000	−1.0001	−0.0000	0.5100
SE	825.00	0.008	−2.0000	−2.0000	−0.0000	0.3125

Table 6. Descriptive of Mann–Whitney *t*-test for independent samples.

	Group	Mean	Median	Standard Deviation	SE
mobile phone	rural	1.8750	2.0000	0.8530	0.1349
	urban	2.9667	3.0000	0.8629	0.1114
tablet	rural	1.2000	1.0000	0.5164	0.0816
	urban	1.8333	1.0000	1.1374	0.1468
PC	rural	1.3250	1.0000	0.7642	0.1208
	urban	2.4667	2.0000	1.0651	0.1375
smart TV	rural	1.2500	1.0000	0.8086	0.1279
	urban	1.9333	2.0000	0.8410	0.1086
SE	rural	5.3500	5.0000	2.8243	0.4466
	urban	6.6500	7.0000	1.8850	0.2434

4.3. Differences in Psychological and Cognitive Well-Being Among Groups

An independent-sample Mann–Whitney *t*-test was performed to see if there were significant differences between the two groups with regard to the variables of psychological and cognitive well-being (reserve cognitive). In Table 7, we can see a clear difference between the urban and rural groups. In particular, all dimensions of CRIq and the CRI total show significant differences between the two groups, with higher values for urban users. An interesting aspect is the effect of variability in the two groups: the standard deviation values in Table 8 show that urban users have a greater dispersion of data than rural users: cognitive reserve in rural areas tends to be more homogeneous, and in cities, there are more marked differences between individuals. In the differences related to total wellbeing and its size, a difference between urban and rural groups is evident, but greater homogeneity emerges.

Table 7. Mann–Whitney *t*-test for independent samples.

	U Statistic	*p*	Mean Difference	95% Confidence Interval		Effect Size (Rank Biserial Correlation)
				Lower	Upper	
CRI_S	250.50	<0.001	−23.00	−28.00	−18.00	0.7913
CRI_W	776.50	0.003	−12.00	−19.00	−4.00	0.3529

Table 7. *Cont.*

	U Statistic	*p*	Mean Difference	95% Confidence Interval		Effect Size (Rank Biserial Correlation)
				Lower	Upper	
CRI_FT	664.00	<0.001	−16.00	−24.00	−8.00	0.4467
CRI_Tot	306.50	<0.001	−21.00	−27.00	−16.00	0.7446
Ben-PS	569.00	<0.001	5.00	3.00	7.00	0.5258
Ben-CS	1097.50	0.472	1.00	−1.00	2.00	0.0854
Ben-EC	784.00	0.003	3.00	1.00	4.00	0.3467
Ben-Tot	777.50	0.003	9.00	3.00	15.00	0.3521

Table 8. Descriptive of Mann–Whitney *t*-test for independent samples.

	Group	Mean	Median	Standard Deviation	SE
CRI_S	rural	99.0000	96.5000	10.0944	1.5962
	urban	122.6167	118.5000	16.9806	2.1922
CRI_W	rural	100.3000	100.5000	14.3352	2.2666
	urban	110.3833	112.5000	18.1641	2.3450
CRI_FT	rural	103.3750	104.5000	16.1986	2.5612
	urban	120.4333	118.5000	21.7102	2.8028
CRI_Tot	rural	100.9750	101.5000	10.7739	1.7035
	urban	123.5667	121.5000	18.3519	2.3692
Ben-PS	rural	38.0250	39.0000	4.6492	0.7351
	urban	33.2500	33.0000	5.0106	0.6469
Ben-CS	rural	27.3750	28.0000	4.5273	0.7158
	urban	27.0833	27.0000	3.7656	0.4861
Ben-EC	rural	33.3250	34.0000	4.3876	0.6937
	urban	30.6667	32.0000	4.2012	0.5424
Ben-Tot	rural	121.3250	124.5000	13.9273	2.2021
	urban	112.5500	114.5000	13.3231	1.7200

4.4. Correlational Analyses

To assess how much the dimensions could be associated, a correlation analysis was conducted. Given the non-normal distribution of the data (Ben-PS W = 0.97, *p*-value 0.036; Ben-CS W = 0.97, *p*-value 0.080; Ben-EC W = 0.96, *p*-value 0.019; DU W = 0.47, *p*-value < 0.001; SE W = 0.94, *p*-value <0.001; CRI_S W = 0.93, *p*-value < 0.001; CRI_Tot W = 0.97, *p*-value 0.027; Residence W = 0.62, *p*-value < 0.001), a Spearman correlation coefficient was calculated. The correlation analyses are shown in the tables below (Tables 9 and 10).

Table 9. Correlation analysis of the rural group.

		CRI_Tot	Ben-Tot	DU	SE	Ben-SP	Ben-EC
CRI_Tot	Spearman's rho	-					
	df	-					
	p-value	-					
Ben-Tot	Spearman's rho	0.1715	-				
	df	38	-				
	p-value	0.290	-				

Table 9. *Cont.*

		CRI_Tot	Ben-Tot	DU	SE	Ben-SP	Ben-EC
DU	Spearman's rho	−0.3967 *	0.0327	-			
	df	38	38	-			
	p-value	0.011	0.841	-			
SE	Spearman's rho	0.0256	0.1205	−0.1084	-		
	df	38	38	38	-		
	p-value	0.875	0.459	0.506	-		
Ben-SP	Spearman's rho	0.0532	0.7902 ***	0.1203	0.2316	-	
	df	38	38	38	38	-	
	p-value	0.745	<0.001	0.460	0.151	-	
Ben-EC	Spearman's rho	0.1147	0.9382 ***	0.0524	0.1163	0.6557 ***	-
	df	38	38	38	38	38	-
	p-value	0.481	<0.001	0.748	0.475	<0.001	-

Note: * $p < 0.05$, *** $p < 0.001$.

Table 10. Correlation analysis of the urban group.

		CRI_Tot	Ben-Tot	DU	SE	Ben-SP	Ben-EC
CRI_Tot	Spearman's rho	-					
	df	-					
	p-value	-					
Ben-Tot	Spearman's rho	0.0477	-				
	df	58	-				
	p-value	0.717	-				
DU	Spearman's rho	0.0902	0.2031	-			
	df	58	58	-			
	p-value	0.493	0.120	-			
SE	Spearman's rho	0.2443	−0.0981	−0.2261	-		
	df	58	58	58	-		
	p-value	0.060	0.456	0.082	-		
Ben-SP	Spearman's rho	0.1499	0.8731 ***	0.2073	−0.2020	-	
	df	58	58	58	58	-	
	p-value	0.253	<0.001	0.112	0.122	-	
Ben-EC	Spearman's rho	−0.366	0.8045 ***	0.1207	−0.0027	0.5171 ***	-
	df	58	58	58	58	58	-
	p-value	0.781	<0.001	0.358	0.984	<0.001	-

Note: *** $p < 0.001$.

4.5. Regression Analysis

Binomial logistic regressions were conducted to determine whether the use or non-use of digital tools could be predicted by cognitive and psychological well-being. The data are shown in Tables 11 and 12.

Table 11. Binomial logistic regression analysis of the rural group.

Model	Deviance	AIC	R^2McF	R^2CS	R^2N	Overall Model Test		
						χ^2	df	*p*
1	47.2874	51.2874	0.1410	1.1764	0.2360	7.7637	1	0.005

Predictor	Deviance	SE	Z	*p*	Odd ratio	Overall Model Test	
						Lower	Upper
Intercept	−9.3211	3.8752	−2.4053	0.016	0.0001	0.0000	0.1780
CRI_Tot	0.0947	0.0385	2.4601	0.014	1.0993	1.0194	1.1855

Table 12. Binomial logistic regression analysis of the urban group.

Model	Deviance	AIC	R^2McF	R^2CS	R^2N	Overall Model Test		
						χ^2	df	*p*
1	5.3991	9.3991	0.4692	0.0765	0.4903	4.7728	1	0.029

Predictor	Deviance	SE	Z	*p*	Odd ratio	Overall Model Test	
						Lower	Upper
Intercept	32.3992	25.2915	1.2810	0.200	1.177131×10^{18}	0.0000	3.972116×10^{15}
Ben-PS	−0.7171	0.5905	−1.2145	0.225	0.4882	0.1534	1.5530

In the rural group, the overall model of cognitive well-being, as measured by the total Cognitive Reserve Index CRI_Tot, was significant $\chi^2 = 7.76$, $p = 0.005$, with between 17.6% and 23.6% of the variance explained in terms of the probability of non-use of digital tools. Specifically, the OR of 1.09 [95% CI = 1.01, 1.18] indicates that as the level of cognitive reserve increases, the probability of using digital tools, compared with the probability of not using them, increases by 9.93% $(1 - 1.0993) \times 100$ (Figure 1).

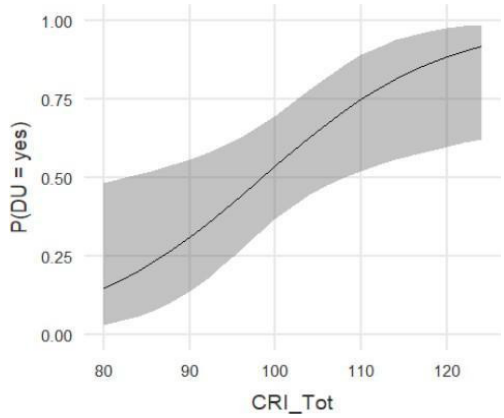

Figure 1. This graph shows the relationship between CRI_Tot (independent variable, X-axis) and the probability that DU = yes (dependent variable, Y-axis) in the rural group. Black line: estimated regression curve. Grey area: confidence interval, representing the uncertainty of the estimate.

In the urban group, the overall model of psychological well-being, specifically the personal satisfaction index Ben-PS, was significant $\chi^2 = 4.77$, $p = 0.029$, with a variance between 0.76% and 4.90% explained in terms of the probability of not using digital tools. Specifically, the OR of 0.48 [95% CI = 0.15, 1.55] indicates that with increasing levels of personal satisfaction, the probability of using digital tools, compared with the probability of not using them, decreases by 51.1% $(1 - 0.4882) \times 100$ (Figure 2).

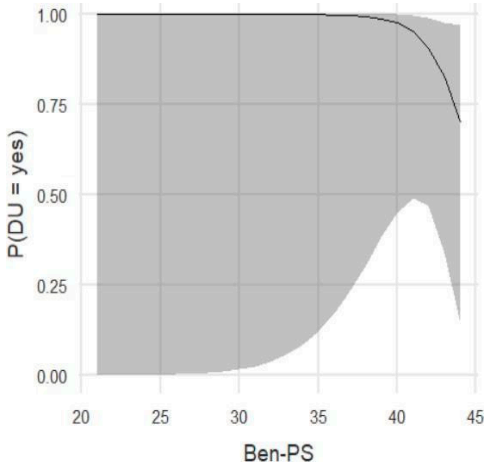

Figure 2. This graph shows the relationship between BEN-PS (independent variable, X-axis) and the probability that DU = yes (dependent variable, Y-axis) in the urban group. Black line: estimated regression curve. Grey area: confidence interval, representing the uncertainty of the estimate.

5. Discussion

The diffusion of digital tools affects most developed countries; however, as some studies highlight [82], even within developed countries differences can be seen. The data of this research are in line with the literature [4,10]; in fact, they highlight the presence of a digital divide, highlighting an uneven diffusion within the two groups, belonging to different realities of the Sardinian territory. The rural area, belonging to the Blue Zone territory, is characterized by low schooling and low income; and the urban area is characterized by high schooling and higher income. Between the two groups, greater utilization, physical access and interest in various activities are noted in the urban group. The rural group reported average levels of cognitive reserve but high levels of psychological well-being, particularly personal satisfaction, versus the urban group's average levels of well-being and average high levels of cognitive reserve. This aspect reflects the findings of the Blue Zone literature, in which given the role the elderly person plays within society and the family, the occupation of leisure time in many recreational and relational activities results in high levels of well-being, offsetting low levels of schooling and resulting in good levels of cognitive reserve [27,93]. Given the results regarding digital use, this appears to be influenced by cognitive and psychological well-being. Specifically, high levels of personal satisfaction in the urban groups seem to decrease the likelihood of accessing digital tools, whereas in the rural group, high levels of cognitive reserve seem to favor the use of digital tools. This finding could be explained by considering the use of digital tools and the role they play in the urban group, carrying out social, relationship and cultural activities, which without digital tools could be hindered and affect well-being. The same finding is not found in the rural group, which is characterized by high well-being and personal satisfaction already from the start and independent of the use of digital tools, which are useless, in these realities [26], to carry out social, creative, and relational activities that are carried out purely offline. What is found instead is that the levels of cognitive reserve, contained in these realities [27], could be predictors of digital use, as also found in the literature [58]. These data allow us to conclude that the use of digital tools can be influenced by well-being, but in different ways when considering different areas of the same region. Psychological well-being and personal satisfaction may be affected in realities in which digital tools allow people to create and hold firm bonds and are useful in cultural and recreational terms, since it is the reality in which they live that makes their use necessary: to get around, to hear from loved ones, and to carry out daily activities now shifted to the online world. On the other hand, in realities where activities are kept alive in the offline world, cognitive

well-being and particularly cognitive reserve may increase the likelihood of use. What we would like to emphasize is that, since we are not certain of the future existence of all the protective factors that characterize Blue Zones, it would be appropriate, given the continuing digitization of activities and services, to initiate programs or courses adapted to the needs and limitations of the elderly to ensure computer literacy and enable them to keep up in the technological world, especially avoiding digital exclusion [17] should family and contextual support fail.

This study has limitations concerning the sample. In fact, it has a higher number of people who identify with the female gender and is therefore not balanced in terms of gender. Furthermore, the size of the sample and the sampling procedure do not allow generalizations to be made about the entire population. In fact, the sampling procedure was probabilistic. For this reason, too, the sample may not be fully representative of the entire population.

Future research should explore the digital divide across various urban and rural contexts in Sardinia, examining how different types of cities and rural areas experience the digital divide and its impact on digital well-being. Such studies would offer a more comprehensive understanding of the factors influencing digital engagement across diverse communities. At the moment, the research focuses on the region of Sardinia, and the study plans to expand to other regions of Italy and Europe to initiate cross-cultural analyses on the topic.

6. Conclusions

Understanding the reasons for the digital divide is certainly important, but above all is finding solutions to resolve it. The research conducted on digital use by the elderly population, its frequency and use provides a snapshot of both the difficulties and the needs of the elderly and helps to provide services based on their interests and expectations. The elderly perceive the extent of the change linked to technologies, which facilitate, in many aspects, their relational life and more generally the aspects linked to information and everyday life, but at the same time, they show the need for digital literacy to enable them to take possession of a tool that offers them the possibility of empowerment, to feel active and in line with the times, and able to speak the same 'language' as the younger generations. Instead, to prevent it from becoming a risk and isolation factor, it is certainly important for society to implement interventions that affect various areas of life: social, economic, political and welfare. Digital inclusion policies for the elderly are needed to overcome that gap related to user skills including through the establishment of training courses specifically dedicated to this age group and relevant to their daily lives. The policy could be to encourage digital learning by funding affordable literacy and training programs for older people. Furthermore, the design of devices should also be rethought, increasing their accessibility, as it is often inadequate with respect to the practical functionality related to the diminished physical and sensory efficiency of the elderly, ensuring that the online platforms providing health, pension and payment services are user-friendly and intuitive. Finally, from a social point of view, the promotion of intergenerational relations aims to foster dialogue between different generations with a view to consider the elderly population as a resource and an opportunity for social development. Feeling part of a community through social interactions, digital aggregation centers and online and in-presence courses or through exchanges of experiences can help the elderly build a positive attitude towards new technologies, with the result of avoiding their exclusion from those aspects of social and personal life that are most closely related to them. Such initiatives would help older adults keep pace with technological advancements and maintain their inclusion in an increasingly digital world. A promising area of research lies in applying the developed

strategies to practical activities, such as courses aimed at older adults, while assessing the effectiveness of these approaches. It is particularly valuable to evaluate how different strategies—visual, argumentative, or practical—impact the motivation to learn to utilize the digital world. Given the complexity of the digital inclusion process, Tomczyk and Kielar's [94] research should heavily emphasize the triangulation of methods, techniques, and tools. This approach would help capture the intricate dynamics of the educational ecosystem, which includes older adults, trainers, and institutions offering solutions for fostering a sustainable information society.

Policies aimed at fostering digital inclusion and promoting the acquisition of digital skills should consider the cognitive and physical barriers that many older adults face in device design [2,78–86,95,96]. By prioritizing inclusivity in the development of digital tools, manufacturers could create more accessible and user-friendly devices [2]. Such improvements would not only facilitate digital access but also foster intergenerational relationships, enhance the sense of purpose among older adults, and promote digital autonomy and self-efficacy [97]. Addressing these barriers is crucial to ensuring that technology serves as a bridge, rather than a divide, for aging populations.

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