



Research article

Rural-urban differences in older adults' life satisfaction and its determining factors

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ABSTRACT

Although determinants of life satisfaction in older adults have been well documented, research has to date failed to fully address the experience of older adults living in places with different levels of urbanization. Furthermore, there are conflictive findings regarding the type of residence environment that offers the greatest benefits for the wellbeing of older adults. Our study proposes an integrative research model to determine the nature of the relationships between loneliness, self-esteem and life satisfaction, with a particular focus on the living environment (rural-urban) of the older adults. Using a cross-sectional survey design volunteers (aged 60+) from rural (n = 198) and urban (n = 198) in Galicia (Spain) completed a questionnaire. Structural Equation Modelling (SEM) was used to test the relationships between loneliness, self-esteem and life satisfaction and multigroup analysis was performed to analyse the existence of differences in the relationships based on the area of residence of older adults. We found that higher levels of loneliness were a significant predictor of reduced life satisfaction and reduced self-esteem. Self-esteem not only increases life satisfaction, but also reduces the negative impact loneliness may have on it. Where the older adults lived had a significant effect on the relationships between loneliness, self-esteem and life satisfaction. The relationships were stronger for older adults living in urban areas. Differentiated policy initiatives should be considered, depending on the area of residence in order to increase the life satisfaction of older adults.

1. Introduction

In recent decades, the European Union (EU) has experienced two parallel processes: population aging and urbanization. The urban population rose from 58 % in 1960 to over 75 % in 2022 [1]. The proportion of population aged 65 and over stands at almost 21 % and forecasts suggest that in 2050, the old-age dependency ratio will exceed 52 % [2,3]. Within this process, a significant number of older adults live in urban areas, many of whom have relocated from rural environments, whilst others remain in their familiar surroundings in line with what is known as “aging in place”. In any case, the residential environment, whether rural or urban, poses various challenges for older adults [4].

Older adults' quality of life is influenced by a large number of factors that range from social support and relationship networks to the environment, residence conditions, financial resources, older adults' degree of activity, autonomy and independence when making

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decisions, as well as physical and mental health [5,6]. In fact, the World Health Organization's quality-of-life scale, known as the WHOQOL-BREF questionnaire, includes 26 questions grouped into four domains: physical health, psychological health, social relationships and environmental health [7,8]. The environmental dimension of the WHOQOL-BREF questionnaire includes items designed to identify aspects including not only the home environment, opportunities for acquiring new information and skills and for recreation, the physical environment and transport, but also health and social care, security and, of course, financial resources.

By 2050, the number of people over 60 years of age will have doubled, and the number of those aged 80 and over will have more than tripled [9]. Although the pace may vary, population aging is a global phenomenon and one of the greatest challenges facing countries is maintaining their citizens' standards of wellbeing. When compared with urban settings, rural areas offer advantages for older adults such as a better natural environment, less pollution or more green spaces for walking and exercising in. In contrast, urban areas offer advantages such as a greater availability of public transport, better housing options or a broader offering of public and commercial services.

There is evidence that the type of residence environment (rural or urban) conditions income levels, access to services or attention received, and therefore influences older adults' quality of life [9,10]. Yet despite this, until recently, geographical considerations had received scant attention in scientific literature [11–13]. In addition, research results had failed to conclude whether the subjective wellbeing of residents in rural (or urban) areas is better or worse than those living in urban (or rural) areas [14–18]. In an aging world, attempting to find older adult-friendly spaces that encourage healthy aging is of vital importance for policy and decision makers.

There is very little scientific literature that provides a structural analysis of the factors that determine the life quality of older adults. This study attempts to fill this gap and also address a number of objectives: a) to analyse the impact of loneliness on the life satisfaction of older adults; b) to consider the mediating role of self-esteem in the relationship between loneliness and life satisfaction; and c) to study how older adults' (urban-rural) area of residence influences the relationship between loneliness, self-esteem and life satisfaction.

The innovative nature of our work is twofold. Firstly, it uses a structural model to analyse the relationships between loneliness, self-esteem and life satisfaction among older adults. Very little research has been conducted into the role of self-esteem as a mediator between loneliness and life satisfaction and none in Galicia (Spain). Secondly, it studies the way older adults' (rural or urban) residence influences the intensity of these relationships. To the best of our knowledge, no studies have to date these impacts. Our work also analyses the importance of socio-economic characteristics (education, living status, economic situation, etc.) in explaining life satisfaction among rural and urban older adults and provides targeted policy recommendations to raise these levels.

Section two of the article presents the background, which includes a theoretical review of the relationship between loneliness, self-esteem and life satisfaction, focusing particularly on older adults. This is followed by a review of scientific literature that has studied how the residence environment influences older adults' wellbeing, as well as the formulation of the study aim and hypothesis. Section three describes the methodology, including an insight into the participants, procedure, and measures. Section four presents the principal results. The article ends with the discussion, policy recommendations and conclusions.

2. Theoretical background

2.1. Loneliness, self-esteem and life satisfaction in older adults

Although it could be considered that aging and the loss of functional capacity reduces life satisfaction, various studies have shown that the correlation between age and life satisfaction is actually not so clear. Indeed, these studies have revealed that older adults show a greater resilience to events such as COVID-19 [19]. A number of authors have termed this phenomenon "the paradox of aging" [20, 21].

More than age, the factors identified as determinants for the life satisfaction in older adults include perceived physical health, physical activity, sexual activity, meaning in life, social support, perceived financial wellbeing, internet use, social networking sites use, or appearance management [20,22–26].

Loneliness is often considered a key indicator in the life satisfaction of older adults [21,27,28]. Some studies have even used loneliness to measure wellbeing in older adults [29]. Living alone is not synonymous with loneliness: some people may live with others yet experience loneliness and others that live alone but do not feel lonely as they enjoy their solitude and consider it a form of freedom [30]. According to Ref. [31], loneliness is the subjective perception of feeling alone, whilst social isolation is an objective circumstance of being alone. At all events, it is clear that people living alone have less social and family contact, which may lead to a perception of loneliness.

[32] defines self-esteem as the negative or positive perception that individuals have of themselves. Although most authors have addressed self-esteem from a global perspective, in recent years some studies have posited that self-esteem comprises two dimensions: self-worth (self-acceptance or self-respect) and self-efficacy (self-competence) [33]. have even proposed a third dimension: the sense of authenticity.

Several studies have analysed the relationship between self-esteem and life satisfaction in older adults [34–36]. However, few have considered loneliness in relation to self-esteem and life satisfaction, beyond the analysis of the role of self-esteem as a mediator between loneliness and life satisfaction in both young people [37] and older adults [38]. Life satisfaction can be summed up as a subjective overall appraisal of life [39] and is frequently identified as a predictor of subjective wellbeing [21].

2.2. Residence environment and subjective wellbeing

Place of residence is frequently pinpointed as a major determinant for the health and wellbeing of older adults. Several studies have

claimed that rural areas offer benefits in terms of their natural environment, associated with peace and tranquillity. Furthermore, these areas boast a greater social capital and higher levels of community connectedness [10,11]. Conversely, income, employment and education and training opportunities tend to be lower in rural areas [11,40].

Urban areas provide benefits regarding questions such as public transport, as well as a wider offer in areas such as housing, public and commercial services, including the internet. These areas also offer greater employment opportunities and better access to health and social services. In contrast, issues that may negatively affect the quality of life experienced by older adults such as noise, pollution and crime, often have a greater presence in urban areas, especially inner cities [41].

Studies that have considered the existence of advantages and disadvantages associated with the place of residence (rural or urban) have reached varying conclusions. Some point to higher levels of life satisfaction among older adults in rural areas [17], whilst others have concluded that life satisfaction is higher among those living in urban areas as they participate more in society, feel less lonely or have fewer depressive symptoms [15,16,42,43]. In turn, other studies have failed to determine any significant differences in terms of the residence environment for those aspects that affect the subjective wellbeing of older adults [14,44]. Table 1 shows the main results of the most recent studies that analyse the differences in the subjective of wellbeing of older adults according to their residence environment.

2.3. Study aim and hypothesis

For the purpose of our study, we decided to include people aged 60 and over, resident in both an urban area and a rural area in Galicia (north-west Spain). The aim of our study is twofold. On the one hand, we wished to address the relationship between loneliness, self-esteem and life satisfaction of older adults from a structural perspective, and on the other hand, to determine whether the intensity of these relationships differs in accordance with the place of residence (rural or urban) of the older adults.

Based on our review of existing scientific literature, we expected loneliness to have a negative influence on self-esteem and life satisfaction. Moreover, we believed that the higher the self-esteem of the older adults, the greater their degree of life satisfaction would be. Indeed, we considered that it would have a twofold action: directly boosting life satisfaction and indirectly stemming the negative impact of loneliness. Finally, we considered that the relationship between the constructs under analysis would vary in accordance with the older adults' place of residence. The hypotheses to be tested are given below.

H1. Loneliness will have a negative influence on self-esteem.

H2. Self-esteem will have a positive influence on life satisfaction.

H3. Loneliness will have a negative influence on life satisfaction.

H4. Self-esteem will mitigate the negative effect of loneliness on life satisfaction.

H5. The intensity of the relationship between loneliness, self-esteem and life satisfaction will vary in accordance with older adults'

Table 1
Rural-urban differences in aspects related to the subjective well-being of the older adults.

| Reference | Geographic area/ Population segment | Measures | Empirical results |
|---|---|--|---|
| St John, Blandford and Strain (2006) | Manitoba (Canada)/ individuals aged 65+ | Depressive symptoms | No rural-urban differences |
| Lau and Morse (2008) | Australia/50–89 years old | Satisfaction with aging; emotional health; general health; self-esteem; stress ... | Greater satisfaction with aging, higher general and emotional health and greater self-esteem among the urban residents but also higher stress levels |
| Drennan et al. (2008) | Ireland/aged 65+ | Social loneliness; emotional loneliness | Living in a rural area was a predictor for social and emotional loneliness |
| Wells (2010) | New York State (USA)/ 65+ | Resilience | No rural-urban differences |
| Lǐ, Liu, Xu and Zhang (2016) | China/aged 60+ | Depressive Symptoms | Rural older adults had more depressive symptoms than urban |
| Vogelsang (2016) | Wisconsin (USA)/63–76 years old | Social participation; Self-Rated Health | Lower levels of participation and self-rated health in rural counties |
| Guo, Bai and Feng (2018) | China/aged 60+ | Social participation; depressive symptoms | The prevalence of depressive symptoms was significantly higher among older adults residing in rural areas than among older adults in urban areas |
| Henning-Smith, Moscovice and Kozhimannil (2019) | USA/average age of the sample population 71 years | Social isolation | Rural residents reported less social isolation and more social relationships than urban residents |
| Byrne et al. (2021) | USA/aged 50+ | Loneliness; social technology use | Loneliness is greater in rural areas compared with urban areas; social technology use is less prevalent among rural older adults than urban older adults. |
| St John et al. (2021) | Canada/45–85 years | Life Satisfaction | Individuals living in rural areas were more satisfied with life than their urban counterparts |
| Wu (2022) | China/aged 60+ | Intergenerational Support; Life Satisfaction | There are rural-urban differences in life satisfaction and intergenerational support |

residence environment.

3. Methods

3.1. Participants and procedure

The inclusion criteria for the sample of older adults were as follows: a) aged 60 or over; b) non-institutionalized older adults; c) no serious health issues that could complicate data collection; d) inclusion in the municipal population censuses of Santiago de Compostela (an urban area) or Outes and Mazaricos (rural areas).

Fig. 1 shows the geographical location of the study area and Table 2 some of the socio-demographic indicators of the older adults' areas of residence. It can be seen that in the rural areas the population is older, has a lower per capita disposable income, lower average pension and a greater percentage of non-contributory pensions (i.e. pensions corresponding to persons that have not paid social security contributions or have not paid them for the time required for entitlement to a contributory pension).

All the items included in the questionnaire required translation from Spanish to Galician to ensure that they would be fully understood by Galician speakers. The University of Santiago de Compostela's internal review board approved the research and verbal consent was obtained from all participants prior to interview.

In 2022, the population of the three municipalities studied was 108,048 people. Once those under 60 or with a severe disability had been excluded, the target population was reduced to 34,157 people. A total of 396 valid questionnaires were obtained. Taking the target population into consideration, the margin of error was less than 5 % under the assumption of maximum indeterminacy and a confidence level of 95.5 % ($p = q = 0$). Non-probability convenience sampling was used, and the sample was split evenly between rural and urban settings. The data were collected using a 20-min face-to-face survey between August 1st and 31st, 2022.

3.2. Measures

3.2.1. Socio-demographics

The interviews provided information that enabled us to draw up a socio-demographic profile of the older adults. This information included sex, age, marital status, living status, educational level, activity sector, or professional situation (self-employed or employee). Given that a large proportion of the older adults interviewed are retired, these latter two characteristics refer essentially to when they were economically active.

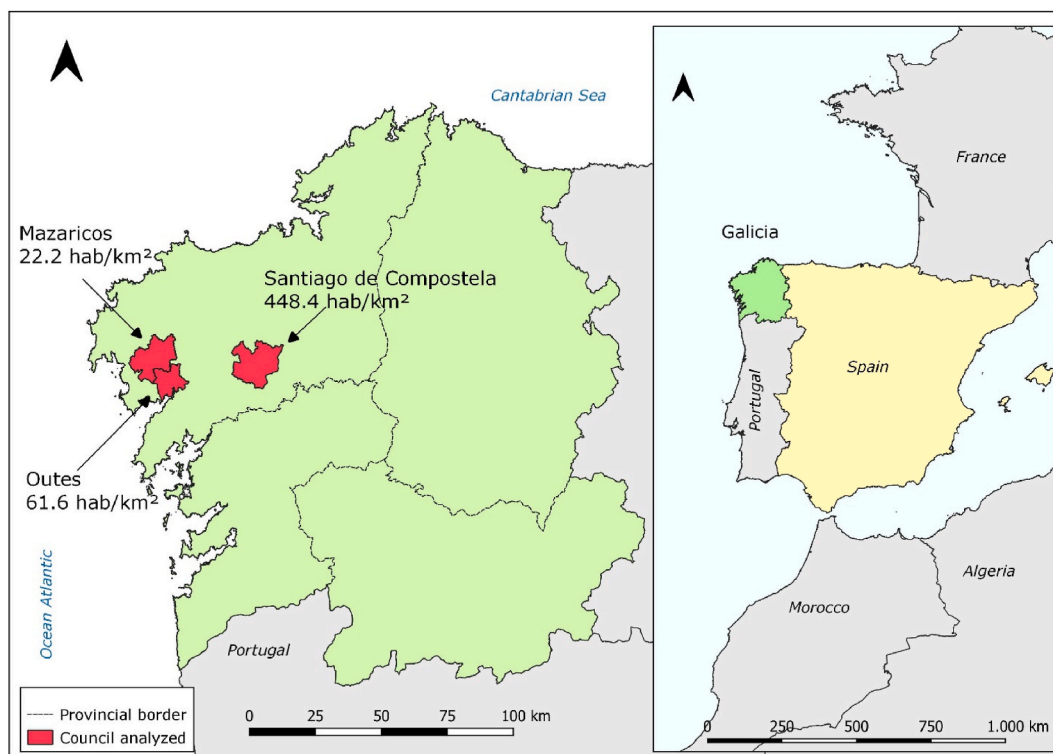


Fig. 1. Geographical location of the area studied.

Table 2
Sociodemographic characteristics of the territories.

| | Population density | Median age | Per capita disposable income | Average pension | Non-contributory pension ^a |
|-----------------|--------------------|------------|------------------------------|-----------------|---------------------------------------|
| Urban area | 448.4 | 45.9 | 19,347 | 1,178 | 5.0 |
| Rural area | 41.9 | 53.9 | 13,366 | 731 | 5.6 |
| Average Galicia | 91.2 | 47.7 | 15,863 | 1,011 | 5.3 |

Data for 2021.

^a Non-contributory pensions for every 100 persons aged 65 and over.

3.2.2. Loneliness

An abridged version of the UCLA Loneliness Scale (Version 3) was used to assess loneliness [45]. This scale has been validated with older adults in a number of countries [46,47] and used with Spanish older adults [48].

Drawing on previous research [49], participants were asked about subjective feelings of loneliness on a 5-point Likert scale (in comparison to the original scale, the values were changed, where 1 was never; and 5, always). Four questions were formulated as follows: “How much of the time do you feel ... ?” and ended with: “you lack companionship”, “left out”, “isolated from others” and “alone”. In the current study, the scale had a Cronbach standardized alpha of 0.90.

3.2.3. Self-esteem

Self-esteem was assessed using Rosenberg’s 10-item self-esteem inventory. This scale is used extensively to analyse self-esteem in older adults [38,50,51] and has also been tested on Spanish-speaking older adults [52,53].

Five questions were posed from a positive perspective: “I feel that I’m a person of worth, at least on an equal plane with others”, “I feel that I have a number of good qualities”, “I am able to do things as well as most other people” and “I take a positive attitude toward myself”. In turn, the remaining five questions adopted a negative perspective: “I feel I do not have much to be proud of”, “All in all, I am inclined to feel that I am a failure”, “I wish I could have more respect for myself”, “I certainly feel useless at times” and “At times I think I am no good at all”. The questions were formulated on a 5-point Likert-type scale. In comparison to the original scale, item scores were changed in the “the more, the better” direction (where 1 was strongly disagree; and 5, strongly agree). Furthermore, items formulated from a negative perspective were reverse-coded.

3.2.4. Life satisfaction

The Satisfaction With Life Scale (SWLS) was applied to measure life satisfaction. This scale was drawn up by Ref. [54] and has been tested and used in previous studies addressing older adults [23,38,50].

Table 3
Sample profile. Descriptive analysis and differences (qualitative variables).

| | Urban (%) | Rural (%) | Chi-square test p |
|-------------------------------------|-------------|-------------|--------------------------|
| Gender | | | |
| Male | 40.9 | 40.9 | 0.541 |
| Female | 59.1 | 59.1 | |
| Age | | | |
| 60-69 | 37.4 | 44.9 | 0.076 |
| 70-94 | 62.6 | 55.1 | |
| Marital status | | | |
| Married | 67.7 | 65.7 | 0.375 |
| Other situations | 32.3 | 34.3 | |
| Living status | | | |
| Alone | 17.7 | 18.2 | 0.000^b |
| With a partner | 57.1 | 33.8 | |
| Other situations | 25.3 | 48.0 | |
| Education | | | |
| Primary incomplete | 0.5 | 21.7 | 0.000^b |
| Primary | 22.2 | 44.4 | |
| Secondary | 62.6 | 32.8 | |
| University | 14.6 | 1.0 | |
| Activity sector ^a | | | |
| Primary | 9.1 | 64.6 | 0.000^b |
| Secondary | 30.8 | 17.2 | |
| Tertiary | 60.1 | 18.2 | |
| Professional situation ^a | | | |
| Self-employed | 16.7 | 52.5 | 0.000^b |
| Employee | 83.3 | 47.5 | |

^a Only 12 % of those interviewed stated that they were currently economically active, and therefore the majority of the results refer to periods when they were economically active.

^b Superscripts indicates that there are statistically significant differences between groups (significance level of 5 %). The highest values are given in bold.

Five items were formulated: “In most way, my life is close to ideal”, “The conditions of life are excellent”, “I am satisfied with life”, “So far, I have gotten the important things I want in my life” and “If I could live my life over, I would change almost nothing”. The respondents rated each statement on a 5-point Likert-type scale. Higher scores indicated greater life satisfaction. The Cronbach standardized alpha on this measure for the current study was 0.90.

4. Results

4.1. Socio-demographics and profiles of respondents

Sample characteristics and results of Chi-square tests are presented in Table 3. The sample consisted of 41 % men and 59 % women. Approximately 67 % of the respondents said they were married and 37 % in other situations (single, separated, divorced, or widowed). There were no significant differences according to place of residence (rural or urban).

The results revealed statistically significant differences in living situations depending on the area of residence. In rural areas, the older adults live mainly with their children, grandchildren or other family members (“other situations”). In the city, older adults live principally with their partners.

Those residing in rural areas tend to have a lower level of education (in comparison with those living in the city) and to have been economically active in the primary sector (agriculture and fishing), normally as self-employed workers. In addition, there are statistically significant differences between rural and urban areas.

The older adults showed relatively low levels of loneliness in the various items (see Table 4). The item that obtained the highest average (2.2 on a scale from 1 “never” to 5 “always”) was “How much of the time do you feel the lack of company?”. Those resident in rural areas gave a lower rating to all the items on the loneliness scale, indicating a lower perception of loneliness.

In global terms, the results revealed a positive sense of life satisfaction, with all items obtaining an average score of more than 3.7. In this case, the scores of those older adults residing in the urban areas were higher than those living in rural areas. The older adults gave their health a score of 3 on a scale from 1 “very bad” to 5 “very good”. Satisfaction with health is significantly lower for the rural sub-sample than for the urban sub-sample.

Turning to self-esteem, given the varying (positive and negative) formulation of the questions used and the variety and extent of the items, a factorial analysis was conducted, the results of which are discussed below.

4.1.1. Underlying dimensions of self-esteem

The exploratory factor analysis (EFA) was performed to determine the underlying dimensionality of self-esteem. Principal component factor analysis with varimax rotation was applied to the final data and an item with communality of under 0.5 was eliminated. Three factors with an eigenvalue greater than one explained 81.7 % of the variance reflected on the self-esteem scale. Factor loadings of variables ranged from 0.70 to 0.96. In this sense, our study complies with the criteria put forward by [55, pp. 122–129], namely factor loadings equal to or above 0.50, eigenvalues equal to or above 1.0, and factor analysis results that explained at least 60 % of the total variance [56].

Factor 1 displayed the greatest variance (41 %) with a reliability coefficient of 0.96. This factor incorporated three items of self-esteem related to positive self-perception (to feel to be a person of worth; to feel to have a number of good qualities and to be able to do things as well as most other people). Factor 2 contained approximately 27 % of the variance in data and includes five items with a negative formulation that attempt to determine the usefulness, validity or efficacy that older adults attribute to themselves. Finally, factor 3 accounted for 14 % of the variance with two items aimed at identifying positive self-perceptions in a more global manner.

Factors 1 and 3 include items related to aspects that a number of authors have termed “self-worth”, which, in the case of factor 3, have been addressed in a more general manner. Self-worth is the degree to which individuals feel positive about themselves, or in other words, the extent to which they feel that they are good and valuable [33,57]. Factor 2 includes questions designed to identify the respondents’ capacity to resolve certain situations. This dimension of self-esteem has been referred to as self-efficacy, self-competence or the agency motive [57]. In line with these earlier studies, we opted to refer to the three factors resulting from the EFA as “self-worth”

Table 4
Mean and differences (quantitative variables).

| | Urban | Rural | Anova test (p) |
|--|-------|-------|--------------------|
| Loneliness | | | |
| How much of the time do you feel the lack of company? | 2.18 | 2.15 | 0.722 |
| How much of the time do you feel you feel left out? | 2.11 | 1.79 | 0.000 ^a |
| How much of the time do you feel isolated from others? | 2.12 | 1.78 | 0.000 ^a |
| How much of the time do you feel alone? | 2.18 | 2.06 | 0.064 |
| Life Satisfaction | | | |
| In most ways, my life is close to ideal | 3.86 | 3.56 | 0.000 ^a |
| The conditions of life are excellent | 3.89 | 3.66 | 0.001 ^a |
| I am satisfied with life | 3.90 | 3.73 | 0.012 ^a |
| So far, I have gotten the important things I want in my life | 3.91 | 3.74 | 0.015 ^a |
| If I could live my life over, I would change almost nothing | 3.47 | 3.21 | 0.027 ^a |
| Satisfied with health | 3.17 | 2.93 | 0.020 ^a |

^a Superscripts indicates that there are statistically significant differences between groups (significance level of 5 %).

(factor 1), “global self-worth” (factor 3) and “self-efficacy” (factor 2).

Cronbach alphas for all three factors were robust, falling within a range of 0.81–0.96, considerably higher than generally agreed lower limit of 0.60 for research at exploratory stage [58]. This points to a high internal consistency in terms of factor variables. Table 5 illustrates the EFA for self-esteem.

4.1.2. Testing the relationship between loneliness, self-esteem and life satisfaction

Despite the fact that the Rosenberg Self-Esteem Scale is amply used in approximately self-esteem, there are major discrepancies in the treatment of negative items. Various studies have concluded that the inclusion of negative items leads to measurement errors and reduces reliability [59–61]. For this reason, we limited our structural analysis to examining the relationship between loneliness, self-esteem and life satisfaction to factors 1 and 3 of self-esteem, which include positively formulated items and omitted factor 2, which consists of negatively formulated items. Likewise, as two loneliness items were closely correlated, we opted to eliminate one of them. In addition, one item of the life satisfaction construct was removed since standardized factor loading was found to be below 0.3 [62].

Structural Equation Modelling (SEM) was used to test the relationships between loneliness, self-esteem and life satisfaction. Missing values and outliers were checked with SPSS software, revealing no significant outliers. Since missing values stood at less than 10 %, the listwise deletion method was used. Normality was checked with SPSS and AMOS. Skew and kurtosis were <3, indicating a normal distribution of the variables observed [63].

A confirmatory factor analysis (CFA) using AMOS software with maximum likelihood estimation (MLE) tested the convergent validity of the constructs used for the analysis. Table 6 summarizes the principal results. The mean and standardized deviations for each of the 9 items are reported. The loneliness items ranged from 1.95 to 2.20 on a Likert scale of 1–5, indicating low levels of loneliness among older adults. The mean values for the self-esteem factors were 4.45 for “self-worth” and 4.45 for “global self-worth”. Finally, the life satisfaction items ranged from 3.71 to 3.83, indicating high life satisfaction.

The convergent validity of the measurement scale was also tested: t-values for all the standardized factor loadings of the items were significant ($p < 0.001$), indicating a significant relationship between all the variables and their specified constructs. This proved the relationships proposed between indicators and constructs. Squared multiple correlations (SMC) ranged from 0.50 to 0.98, pointing to a considerably high degree of reliability of the measurement model (convergent validities. The AVE for all the constructs exceeded the minimum value of 0.5 [64,65]. According to the Fornell-Larcker criterion, the square root of each AVE (0.80 for loneliness, 0.50 for self-esteem and 0.90 for life satisfaction) is greater than the related inter-construct correlations (which oscillate between 0.26 and 0.29). These results shown in Table 6 therefore confirm the convergent validity and soundness of the measurement model.

Other assessments included the goodness of fit of the measurement model. The $\chi^2/d. f.$ ratio of the model is 3.39 (81.42/24), indicating an acceptable fit. Other indicators of goodness of fit are GFI = 0.95, AGFI = 0.91, CFI = 0.99, TLI = 0.98, NFI = 0.98, RMSEA = 0.07, RMR = 0.01 and Standardized RMR = 0.03. The values indicated a satisfactory level of fit indices.

The significance test for the estimated coefficients (paths) is a logical choice for examining the structural model, laying the foundations for the acceptance or rejection of the possible relationships between latent constructs. According to the AMOS results, all the paths proposed were correctly directed and statistically significant, in line with the theoretical relationships evidenced by literature: 1) It was found that the measure of loneliness significantly and negatively affects the measure of self-esteem ($\beta = -0.220$; $t = -2.820$), thereby supporting H1. 2) Self-esteem was found to have significant and positive path coefficients toward life satisfaction ($\beta = 0.223$; $t = 3.363$), supporting H2. 3) Loneliness negatively influenced life satisfaction ($\beta = -0.199$; $t = -3.837$), thus supporting H3. Direct and indirect effects were also checked. The effect of loneliness on self-esteem and the effect of self-esteem on life satisfaction are very similar. Loneliness influences life satisfaction both directly (-0.199) and indirectly (-0.049). Thus, self-esteem mediates the relationship between loneliness and life satisfaction, mitigating the negative effect of loneliness on life satisfaction, supporting H4. Table 7 shows the standardized estimates of the path coefficients and the indirect and total effects between the latent factors. Fig. 2 illustrates the relationships between the latent factors.

Table 5
Underlying dimensions of Self-esteem.

| | Eigenvalue | Variance explained (%) | Cronbach's α | Factor loadings | Communal. |
|---|------------|------------------------|---------------------|-----------------|-----------|
| F1 Self-worth | 3.68 | 40.86 | 0.96 | | |
| I feel that I have a number of good qualities | | | | 0.96 | 0.95 |
| I am able to do things as well as most other people | | | | 0.94 | 0.94 |
| I feel that I'm a person of worth, at least on an equal plane with others | | | | 0.92 | 0.87 |
| F2 Self-efficacy | 2.46 | 27.28 | 0.81 | | |
| I certainly feel useless at times | | | | 0.87 | 0.77 |
| All in all, I am inclined to feel that I am a failure | | | | 0.86 | 0.76 |
| At times I think I am no good at all | | | | 0.85 | 0.73 |
| I feel I do not have much to be proud of | | | | 0.70 | 0.52 |
| F3 Global self-worth | 1.22 | 13.55 | 0.90 | | |
| I take a positive attitude toward myself | | | | 0.92 | 0.91 |
| On the whole, I am satisfied with myself | | | | 0.91 | 0.90 |

Table 6
Results for measurement model.

| | Mean | Standard Deviation | Std. Ind. Loadings | SMC | CR | AVE |
|--|------|--------------------|--------------------|-------|------|-----|
| Loneliness | | | | | 0.93 | 0.8 |
| Feeling left out | 1.95 | 0.52 | 0.96 | 0.922 | | |
| Feeling isolated from others | 1.95 | 0.52 | 0.99 | 0.979 | | |
| Feeling alone | 2.12 | 0.62 | 0.748 | 0.979 | | |
| Self-esteem | | | | | 0.62 | 0.5 |
| Self-worth | 4.45 | 0.55 | 0.551 | 0.503 | | |
| Global self-worth | 4.27 | 0.77 | 0.777 | 0.604 | | |
| Life Satisfaction | | | | | 0.97 | 0.9 |
| The conditions of life are excellent | 3.71 | 0.85 | 0.902 | 0.813 | | |
| I am satisfied with life | 3.78 | 0.70 | 0.965 | 0.93 | | |
| I have gotten the important things | 3.81 | 0.68 | 0.978 | 0.956 | | |
| So far, I have gotten the important things I want in my life | 3.83 | 0.68 | 0.92 | 0.846 | | |

Table 7
Summary of the standardized estimates of path coefficients between Loneliness, Self-esteem and Life Satisfaction.

| | β | t | Hypotheses test results |
|---------------------------------|----------|---------------------|-------------------------|
| Loneliness → Self-esteem | -0.220 | -2.820 ^b | Supported |
| Self-esteem → Life satisfaction | 0.223 | 3.363 ^a | Supported |
| Loneliness → Life satisfaction | -0.199 | -3.837 ^a | Supported |
| | Indirect | Total | |
| Loneliness → Life satisfaction | -0.049 | -0.248 | Supported |

^a p < 0.001.
^b p < 0.01.



Fig. 2. Results of older adults' Life Satisfaction model.

4.1.3. Rural-urban differences

The model was tested using multigroup analysis in order to verify Hypothesis 5 and to analyse the existence of differences in the relationships based on the area of residence (urban or rural) of older adults. Table 8 reports the results from the simultaneous modelling of the relationship between loneliness and self-esteem, self-esteem and life satisfaction and loneliness and life satisfaction for each group. We found that the relationship between loneliness and self-esteem is only significant in the case of older adults residing in urban areas. The same is true of the relationship between self-esteem and life satisfaction, which again is only significant for older adults that live in the city. No significant differences were detected in the relationship between loneliness and life satisfaction based on the older adults' place of residence.

By observing the regression weights, other findings should also be noted. Namely that the relationship between loneliness and self-esteem, between self-esteem and life satisfaction and between loneliness and life satisfaction is stronger among older adults living in urban areas. In other words, this type of analysis allows the identification of two segments of older adults in terms of the antecedents of life satisfaction.

Table 8
Results of the path differences between urban and rural older adults.

| | Urban (β) | Rural (β) |
|---------------------------------|-------------------|-------------------|
| Loneliness → Self-esteem | -0,432*** | -0,240 |
| Self-esteem → Life Satisfaction | 0,189* | 0,068 |
| Loneliness → Life Satisfaction | -0,405*** | -0,216** |

5. Discussion

5.1. *The relationship between loneliness, self-esteem and life satisfaction in older adults*

Our study analyses the structural relations between loneliness, self-esteem and life satisfaction in older adults, and the impact of the residence environment on the intensity of these relationships. The results of our work reveal the influence of loneliness and self-esteem on older adults' life satisfaction. In line with earlier studies [21,23], our research evidenced the negative association between life satisfaction and loneliness in older adults. The findings of this study are also consistent with those of a previous study that established a positive significant path between self-esteem and life satisfaction in older adults [34,35].

5.2. *The role of self-esteem in the relationship between loneliness and life satisfaction*

When the relationship between loneliness and life satisfaction included the notion of self-esteem, there was a considerable drop in the relationship between them, offsetting the negative implications of loneliness in terms of life satisfaction. This means that self-esteem is indirectly significant when considering loneliness and life satisfaction. Considering self-esteem as a mediator is in line with [38] who consider that any negative impacts of loneliness on life satisfaction can be counteracted by boosting seniors' self-esteem. They believe that this is possible by encouraging older adults to get involved in lifelong learning activities.

5.3. *The impact of the residence environment on the life satisfaction of older adults*

The results of this study showed that life satisfaction was lower in the rural sub-sample, in line with other studies such as [43,66]. However, they contrast with the results obtained by other authors such as [67] or [17] that point to greater life satisfaction among older adults living in rural areas.

The results of our research revealed that the rural sub-sample had a lower level of education and worked mainly in the primary sector (agriculture and fishing). Furthermore, in many cases they were also self-employed. Jobs of this type are normally associated with lower wages and social security contributions, and therefore to lower retirement pensions and incomes in old age. The data in Table 2 reflect a lower per capita disposable income, a lower average pension and a greater percentage of non-contributory pensions in rural areas. In Spain, a non-contributory retirement pension is approximately a third of the average contributory pension [68]. In line with previous studies [21], our studies found that life satisfaction is higher among older adults that had a higher level of education and were more engaged (married or cohabiting). In comparison with the urban sub-sample, older adults in the rural sub-sample have a lower level of education and a lower percentage live with their partners.

The (rural or urban) residence environment of older adults conditions the intensity of the relationship between loneliness, self-esteem and life satisfaction. The results of this study showed that the relationship between loneliness and self-esteem and between loneliness and life satisfaction is stronger in older adults living in urban areas. The extent of loneliness was greater among older adults of the urban sub-sample compared to rural sub-sample, which is supported by a number of studies [69] even though others have identified greater loneliness in older adults resident in rural areas [16,42,70]. In comparison with those living in rural areas, older adults resident in the urban area reported higher levels of life satisfaction which were also more closely linked to their degree of loneliness. In our study, the impact of loneliness on the life satisfaction of older adults in rural areas was found to be significant, albeit to a lesser degree than in the case of those resident in the urban area.

In terms of the difference between loneliness and living alone, the results of our study were consistent with those of other authors [31]. In comparison with the members of the rural sub-sample, more older adults in the urban sub-sample lived with their partners and fewer alone, yet they reported higher levels of loneliness. The results are in line with those of [71], who found that young people living in urban areas reported higher levels of isolation. This highlights that notion that in relationships, quality is more important than quantity. Studies such as those conducted by Ref. [72] also highlighted the poorer quality of the relationships of older adults living in urban areas. It is for this reason that when measuring social isolation, researchers in this field have stressed the need of considering not only the quantity of social interactions, but also their quality [73].

Although residents in urban areas have more opportunities for social interaction than their counterparts in rural areas, thereby potentially reducing their perception of social isolation, the results of our study show that older adults living in the city reported greater levels of loneliness. In the case of the older adults in our urban sub-sample, self-esteem contributed to mitigating the negative effect of loneliness on life satisfaction. The results of our research could provide a guide for the design of policies to improve older adults' wellbeing both in urban and rural areas.

In addition to its contributions, the study also presents a series of limitation. Firstly, these results should be replicated in other regions of Spain or in other countries, in order to contrast the robustness of the results. Secondly, although this study provides useful data that provide a deeper insight into the life satisfaction of older adults and its determining factors, the study used a cross-sectional design, and the data were collected in a year (2022) in which the impact of the COVID-19 pandemic on the dimensions analysed was still evident. In addition, the rise in living costs, one of the consequences of the war in Ukraine, may have influenced the perceptions of the older adults. It would therefore be recommendable to conduct a longitudinal study that would shed greater light on these associations and boost confidence regarding the causal direction of the influences.

6. Recommendations and practical implications

In an increasingly aging society in which older adults will play a growing role, guaranteeing increased wellbeing for older population segments is set to become a priority. The results of our study may contribute to future changes in policy making, as the perception of loneliness is significantly and negatively associated with life satisfaction, pointing to a need for social intervention programmes that will place the focus on encouraging relations and reducing loneliness.

The results of our study highlight the moderating role of self-esteem in the relationship between loneliness and life satisfaction. Self-esteem mitigates the impact of loneliness on life satisfaction. Boosting older adults' self-esteem is therefore an essential instrument for increasing life satisfaction and mitigating the negative effect of loneliness. Older adults' participation in training, courses and lifelong learning activities may well be one way of achieving this. Older adults should not merely be the passive recipients of these activities but should also be encouraged to use their experience actively to pass on the knowledge and cultural heritage acquired over the years.

The results show lower life satisfaction amongst older adults resident in rural areas despite reporting lower levels of loneliness. Rural areas offer their residents a series of benefits and in EU member states, older adults are generally more inclined to live in rural regions than younger people [39]. However, living in rural areas also has a number of drawbacks that must be tackled if the aim is to provide greater quality of life in these areas and prevent their depopulation – a phenomenon referred to in Spain as “empty Spain” [74].

Rural areas, and those in Galicia in particular, are characterised by deficient communication and transport services. In rural areas, bus services are infrequent, taxis are scarce, and high-speed train lines have been promoted to the detriment of local train services, favouring cities over rural areas and aggravating territorial polarisation [75]. If the aim is to revitalise rural environments and improve the quality of life of their residents, improvements must be made to these transport services and connections in rural settings.

Several studies have highlighted the positive contribution of the internet in improving older adults' wellbeing and quality of life, providing access to telemedicine, favouring social support and reducing loneliness [22,76]. Internet access is also limited in rural settings, and improving this would be an effective way of boosting older adults' life satisfaction.

Further measures should focus on improving access to health and social services such as care homes or day centres, which are few and far between in the rural environment [77–79]. There is also a need to facilitate financial services, which are severely limited in these areas. In the wake of the 2008 economic crisis, Spain not only experienced dramatic cuts in the number of bank branches, leaving many rural areas devoid of these services, but also a sharp hike in online banking, resulting in the exclusion of the older population from services of this kind [80,81].

There is also a need to address the issue of reducing the loneliness experienced by older adults living in urban areas. It is clear that living with other people does not necessarily imply lower levels of loneliness. The findings of our study indicated slightly higher average scores among the urban sub-sample in the items based on loneliness. Furthermore, the relationship between loneliness and life satisfaction is stronger among city residents.

Living in a city surrounded by people does not imply lower levels of loneliness. Although the number of contacts and relations may be higher in urban area, these connections may be weaker and unstable and therefore play a less relevant role in the provision of social support and company for older adults. As [84] pointed out, one way to reduce loneliness and depression is to increase neighbourhood social cohesion. Policy makers should be called on to introduce social intervention actions designed to promote family relations and contact and ties among residents in various neighbourhoods. These actions would contribute to enhanced relations and offset the problems of loneliness that are common among older adults resident in urban environments.

7. Conclusions

The main aim of this study was to examine the association between loneliness, self-esteem and life satisfaction among older adults in Galicia (Spain), with a particular focus on the (rural-urban) residence environment of the older adults. The data support an association between these variables in the predicted direction and the results provide strong support to the theoretical model proposed.

Older adults' life satisfaction depends significantly on loneliness. The greater the perceived loneliness, the lower the degree of life satisfaction. Loneliness also impacts significantly and negatively on self-esteem. In turn, self-esteem has a positive and significant influence on life satisfaction. Self-esteem not only increases life satisfaction, but it also reduced the negative impact of loneliness on life satisfaction.

Where older adults live had a significant effect on the relationship between loneliness, self-esteem and life satisfaction, which was stronger for older adults living in urban areas. These results may be partly explained by the slightly higher means for loneliness reported among urban older adults. Reported self-esteem mitigated the impact of loneliness on life satisfaction in older adults living in the city.

Our findings support previous studies, indicating that spatial differences are largely attributed to distinct socio-cultural backgrounds of older adults. Previous research has shown the importance of cultural background, socio-economic characteristics, local participation and integration, or the composition of the network of relatives and friends in explaining the loneliness, self-esteem or life satisfaction of older adults.

The work carried out points to several possible future lines of research. Various studies have pointed to the importance of social support in reducing loneliness and increasing life satisfaction [21,82,83]. Future studies should introduce social support into the model to analyse its impact on the relationship between loneliness, self-esteem and life satisfaction. This would provide a holistic vision of the factors that influence the quality of later life.

Data availability statement

Considering a) the small size of some of the municipalities included in the study and b) that the data in the database incorporates private information of the participants, data will be made available on request and the data that support the findings of this study are available from the corresponding author.

CRediT authorship contribution statement

Sara Rey-Beiro: Writing – original draft, Methodology, Data curation, Conceptualization. **Fidel Martínez-Roget:** Writing – original draft, Supervision, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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