

Active ageing among elderly community members: structural equation modeling analysis

Envelhecimento ativo entre idosos comunitários: análise de modelagem de equações estruturais
Envejecimiento activo entre ancianos comunitarios: análisis del modelado de ecuación estructural

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ABSTRACT

Objective: to propose a structural model of active ageing among elderly community members based on the World Health Organization's theoretical framework and to identify the most relevant determinants of active ageing to the proposed model. **Methods:** a cross-sectional and analytical study conducted with 957 elderly community members. Confirmatory factor analysis and structural equation modeling were performed. **Results:** the final measurement model was composed of the six determinants of active ageing: behavioral ($R^2=0.66$); personal ($R^2=0.74$); physical environment ($R^2=0.70$); social ($R^2=0.77$); economic ($R^2=0.44$); and social and health services ($R^2=0.95$). The last one showed good quality of adjustment: $\chi^2/gf=3.50$; $GFI=0.94$; $CFI=0.92$; $TLI=0.90$; $RMSEA=0.05$. By analyzing the trajectories between determinants and active ageing, the most representative was social and health services \leftarrow active ageing ($\lambda=0.97$; $p<0.001$). **Conclusion:** satisfaction with access to health services and positive self-assessment of health status were the factors that most contributed to active ageing in this population.

Descriptors: Health of the Elderly; Ageing; Elderly Statistical Factor Analysis; Geriatric Nursing.

RESUMO

Objetivo: propor um modelo estrutural de envelhecimento ativo entre idosos comunitários, com base no referencial teórico da Organização Mundial de Saúde, e identificar os determinantes do envelhecimento ativo de maior relevância para o modelo proposto. **Métodos:** estudo transversal e analítico, conduzido com 957 idosos comunitários. Realizou-se Análise Fatorial Confirmatória e Modelagem de Equações Estruturais. **Resultados:** o modelo de medida final composto pelos seis determinantes do envelhecimento ativo: comportamentais ($R^2=0,66$); pessoais ($R^2=0,74$); ambiente físico ($R^2=0,70$); sociais ($R^2=0,77$); econômicos ($R^2=0,44$); e serviços sociais e de saúde ($R^2=0,95$), apresentou boa qualidade de ajuste: $\chi^2/gf=3,50$; $GFI=0,94$; $CFI=0,92$; $TLI=0,90$; $RMSEA=0,05$. Na análise das trajetórias entre os determinantes e o envelhecimento ativo, a mais representativa foi serviços sociais e de saúde \leftarrow envelhecimento ativo ($\lambda=0,97$; $p<0,001$). **Conclusão:** a satisfação com o acesso aos serviços de saúde e a autoavaliação positiva do estado de saúde foram os fatores que mais contribuíram com envelhecimento ativo nessa população.

Descritores: Saúde do Idoso; Envelhecimento; Idoso; Análise Fatorial; Enfermagem Geriátrica.

RESUMEN

Objetivo: proponer un modelo estructural de envejecimiento activo entre los miembros de la comunidad de ancianos basado en el marco teórico de la Organización Mundial de la Salud e identificar los determinantes del envejecimiento activo que son más relevantes para el modelo propuesto. **Métodos:** estudio transversal y analítico, realizado con 957 adultos mayores de la comunidad. Se realizaron análisis factoriales confirmatorios y modelos de ecuaciones estructurales. **Resultados:** el modelo de medición final compuesto por los seis determinantes del envejecimiento activo: conductual ($R^2=0.66$); personal ($R^2=0.74$); ambiente físico ($R^2=0.70$); social ($R^2=0.77$); económico ($R^2=0.44$); y servicios sociales y de salud ($R^2=0.95$), que mostraron buena calidad de ajuste: $\chi^2/gf=3.50$; $GFI=0.94$; $CFI=0.92$; $TLI=0.90$; $RMSEA=0.05$. En el análisis de las trayectorias entre los determinantes y el envejecimiento activo, el más representativo fue el de los servicios sociales y de salud \leftarrow envejecimiento activo ($\lambda=0.97$; $p<0.001$). **Conclusión:** la satisfacción con el acceso a los servicios de salud y la autoevaluación positiva del estado de salud fueron los factores que más contribuyeron al envejecimiento activo en esta población.

Descriptorios: Salud del Anciano; Envejecimiento; Anciano; Análisis Factorial; Enfermería Geriátrica.

INTRODUCTION

Demographic transition is in different phases around the world, and together with the epidemiological transition, it results in the main demographic phenomenon of the 21st century, known as population ageing⁽¹⁾. In 2017, 12.3% of the world's population was 60 years old and older⁽¹⁾; in Brazil, this percentage accounted for 13.4%⁽²⁾. Specifically in the state of Minas Gerais, the elderly population corresponds to 11.3%, and 12.6% in the city of Uberaba⁽³⁾.

The greater longevity in Brazil is followed by new social demands that express the need to meet the specificities of this population, in search of maintaining autonomy, independence and quality of life (QoL)⁽⁴⁾. When increasing the number of years lived, it is necessary for government officials to invest in goods and services. Thus, it is possible that the increase in life expectancy is followed by improvements in conditions, so that one can enjoy an active and healthy ageing for the longest possible period of time^(4,5).

From that point of view, in 2002, at the World Assembly on Human Ageing, held by the United Nations in Madrid, experts proposed the guideline for active ageing as a priority for the 21st century⁽⁶⁾. Active ageing is defined as the "process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age"⁽⁷⁾. There are several factors that interfere with the active ageing process, which are interconnected and apply to the health of individuals of all ages^(4,7).

The World Health Organization (WHO) has defined the main determinants of active ageing, namely: culture and gender considered as comprehensive and cross-cutting factors that shape people and the environment in which they are inserted throughout life; personal behaviors and characteristics that are specific to each individual; and the physical environment and the social, economic, social and health services that constitute the contextual factors⁽⁷⁾. Interaction of these factors forms a dynamic network of protection conditions that can both favor the development of reserves for resilient responses and generate risks that prevent this development. At the same time, each determinant also individually influences active ageing⁽⁷⁾.

Despite the political framework of active ageing assumed by WHO, there is still no consensus, among the authors, on the best way to measure it^(5,8-12). In international surveys among elderly people in the community of Portugal^(8,11) and Canada⁽¹²⁾, the structural models of active ageing developed, based on the WHO theoretical framework⁽⁷⁾, did not present adequate indexes of quality of fit. In addition, it should be noted that studies that tested the applicability of the active ageing model proposed by WHO⁽⁷⁾ in the Brazilian population were not identified in nursing scientific literature.

Considering the complexity of this subject, analyzes, such as Structural Equation Modeling (SEM), are necessary to enable the understanding of the interrelation between the multiple variables that involve active ageing. It should be considered that traditional statistical methods apply to a limited number of variables⁽¹³⁾.

Thus, there is a need for carrying out investigations with this theme, which may contribute to public policies aimed at organizing the health care for elderly individuals. It is also considered that such research will be relevant for scientific and social development. Knowledge of data about a given region allows the debate of issues related to public policies, citizenship and social rights.

OBJECTIVE

To propose a structural model of active ageing among community-based elderly, based on the WHO theoretical framework and identify the most relevant determinants of active ageing to the proposed model.

METHODS

Ethical aspects

The Human Research Ethics Committee at *Universidade Federal do Triângulo Mineiro* approved this project. Elderly individuals were contacted at home, to whom the objectives, the Informed Consent Form were presented, and relevant information was offered. After their consent, the interview was conducted.

Design, period, and place of study

This is a cross-sectional and quantitative study guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE). It was developed in the urban area of Uberaba Health Microregion, consisting of eight municipalities such as Água Comprida, Campo Florido, Conceição das Alagoas, Conquista, Delta, Sacramento, Uberaba, and Veríssimo. Data collection was carried out from May 2017 to June 2018 through direct interview.

Population or sample; inclusion and exclusion criteria

For population selection, multiple stage cluster sampling was used. The sample size calculation considered the prevalence of functional disability in Instrumental Activities of Daily Living to be 28.8%⁽¹⁴⁾, with a 3.0% accuracy and a 95% confidence interval, for a finite population of 43,166, reaching to a minimum sample of 858 elderly individuals. Considering a sampling loss of 20%, the maximum number of attempts was 980 elderly.

Elderly people aged 60 and older and living in the Uberaba Health Microregion were included. Institutionalized elderly; with communication problems such as deafness not corrected by devices and severe speech disorders; with cognitive decline assessed by the Mini-Mental State Examination (MMSE)⁽¹⁵⁾; without an informant to answer the Functional Activities Questionnaire (PFEFFER)⁽¹⁶⁾; and with a final score greater than or equal to six points in PFEFFER were excluded.

Nine hundred and seventy-seven elderly individuals were interviewed; 15 were excluded, as they presented cognitive decline in PFEFFER; and five were also excluded who did not complete the full interview. Thus, the sample of this study was composed of 957 elderly.

Study protocol

To conduct the interviews, ten interviewers were selected, who underwent training, qualification and approach on ethical research issues.

The instruments applied in a single moment to measure the determinants of the active ageing model, proposed by WHO⁽⁷⁾, were defined considering the most used in gerontology and validated in Brazil (Chart 1).

Chart 1 shows the instruments used for data collection and the categorization of the observed variables used in the analysis of SEM.

Chart 1 - Instruments to measure the determinants of the active ageing model and categorization of the observed variables

| Determinants | Measured determinants | Instruments | Code in Structural Equation Modeling (SEM) | |
|-----------------------------|--|--|---|---|
| Behavioral | Anthropometric profile | BMI ⁽¹⁹⁾ ; AC ⁽²⁰⁾ ; CC ⁽²¹⁾ ; and BC ⁽²²⁻²³⁾ . | Number of suitable items (0 to 4). | |
| | Physical activity | IPAQ ⁽²⁴⁾ . | Number of healthy life habits (0 to 4). | |
| | Alcohol consumption | Do you usually consume alcoholic beverages? | | |
| | Smoking | Do you smoke? | | |
| | Sleep quality | Do you have any trouble sleeping? | | |
| | Routine consultation | Have you undergone a routine check-up last year? | | |
| | | Preventive examinations | Have you undergone a preventive examination last year? | Number of self-care practices (0 to 5). |
| | | Attitude towards taking medicines | IAAFTR ⁽²⁵⁾ . | |
| | | Vaccination status | Assessment of the vaccination card of elderly individuals ⁽²⁶⁾ . | |
| | | Oral health | When was the last time you went to the dentist? | |
| Personal | Resilience | CD-RISC-25BRAZIL ⁽²⁷⁻²⁸⁾ . | Resilience score. | |
| | Depression, Emotional | GDS-15 ⁽²⁹⁾ . | Number of depressive symptoms. | |
| | Family history for CNCDS | BOMFAQ ⁽³⁰⁾ . | No (1); Yes (0). | |
| | Functioning of the senses | How would you assess the functioning of hearing, vision, taste, smell, touch? | Very bad (1); Bad (2); Neither bad nor good (3); Good (4) and Very good (5). | |
| | Morbidities | BOMFAQ ⁽³⁰⁾ . | Number of morbidities. | |
| | Cognitive ability | MMSE ⁽¹⁵⁾ . | No (1); Yes (0). | |
| Physical Environment | Physical security and protection; physical environment; means of transport; and environment in the home. | Do you feel safe in your daily life? Is your physical environment (climate, noise, pollution) healthy? Are you satisfied with your means of transport? Are you satisfied with the conditions of your place of residence? | Nothing (1); Very little (2); So-so (3); Quite (4); Extremely (5). | |
| Social | Social network | Network and social support scale ⁽³¹⁾ . | Number of relatives and friends. | |
| | Social support | Network and social support scale ⁽³¹⁾ . | Social support score. | |
| | Personal relationships | How satisfied are you with your personal relationships? | Very dissatisfied (1); Dissatisfied (2); Neither dissatisfied nor satisfied (3); Satisfied (4); Very satisfied (5). | |
| | AADL | Thirteen questions of a social nature ⁽³²⁾ . | Number of activities performed. | |
| | Community activities | Are you satisfied with the opportunities you have to participate in community activities? | Very dissatisfied (1); Dissatisfied (2); Neither dissatisfied nor satisfied (3); Satisfied (4); Very satisfied (5). | |
| | Out-of-school activities | To what extent do you have opportunities for leisure activities? | Nothing (1); Very little (2); So-so (3); Quite (4); Extremely (5). | |
| | Education years | How many full years of study do you have? | Full years of study. | |
| Economic | Monthly individual income | What is your individual monthly income? | <1 (1); 1-3 and ≥3. | |
| | Assessment of economic condition | How do you assess your economic condition? | Good (1); Bad (0). | |
| | Money to meet basic needs | Do you have enough money to meet your needs? | Nothing (1); Very little (2); So-so (3); Quite (4); Extremely (5). | |
| | Retirement and pension | Are you a retiree and/or pensioner? | Yes (1); No (0). | |
| | Paid work | Do you have paid work? | Yes (1); No (0). | |

To be continued

Chart 1 (concluded)

| Determinants | Measured determinants | Instruments | Code in Structural Equation Modeling (SEM) |
|----------------------------|--|--|---|
| Social and health services | Access to health care services | Are you satisfied with your access to health services? | Very dissatisfied (1); Dissatisfied (2); Neither dissatisfied nor satisfied (3); Satisfied (4); Very satisfied (5). |
| | Link with the health service | Do you usually seek the same health service when you need care? | Yes (1); No (0). |
| | Access to continuous-use medicines | Do you have access to continuous medicines? | Yes (1); No (0). |
| | Self-assessment of the course of health status | Comparing your health today with that of a year ago, would you say that your health is worse, equal or better? ⁽³⁰⁾ . | Worse (1); Equal (2); Best (3). |
| | Assessment of current health status | How do you assess your health? ⁽³⁰⁾ . | Terrible (1); Bad (2); Regular (3); Good (4); Great (5). |

Note: BMI - Body Mass Index; AC - Abdominal Circumference; CC - Calf Circumference; BC - Brachial Circumference; CNCDS - Chronic Non-Communicable Diseases; AADL - Advanced Activities of Daily Living; IAAFR - Instrument for assessing attitude towards medication; CD-RISC-25BRAZIL - Connor-Davidson Resilience Scale for Brazil-25; BOMFAQ - Brazilian OARS Questionnaire of Functional and Multidimensional Assessment; MMSE - Mini-Mental State Examination.

Analysis of results, and statistics

An electronic database was built using the Excel® program, with double entry. After checking the inconsistencies between the two databases, the database was imported into the Statistical Package for the Social Sciences (SPSS®) 22.0 for analysis.

Confirmatory factor analysis (CFA) was performed using the Analysis of Moment Structures (AMOS®) 23.0 for SPSS® to assess the quality of fit of the measurement model to the correlational structure between the observed variables⁽¹³⁾.

In the adjustment of the model, the strategy of identifying the causal model with latent variables in two stages was used: (1) Specifying and identifying the measurement sub-model; (2) Specifying and identifying the structural sub model, i.e., establishing the trajectories for the endogenous latent variables⁽¹³⁾. This strategy ensures that the measurement model is properly validated and makes it possible to assess the plausibility of the structural model after ensuring the quality of the measurement model⁽¹³⁾.

Active ageing was considered a second order factor for CFA, consisting of six determinants, namely: behavioral; personal; physical environment; social; economic; and social and health services.

The parameters were estimated using the maximum likelihood method. This is the most traditional and used in the analysis of SEM⁽¹³⁾, with previous analysis of normality for the items observed by means of the asymmetry (*sk*) and kurtosis coefficients (*ku*), considering as *sk* index > 3 and *ku* > 10⁽¹³⁾.

The quality of the global adjustment of the factorial model was assessed according to indexes and their respective values: Chi-square and degrees of freedom (χ^2/gf) ≤ 5.0; Goodness of Fit Index (GFI) ≥ 0.90; Comparative Fit Index (CFI) ≥ 0.90; Tucker-Lewis Index (TLI) ≥ 0.90; Parsimony Goodness of Fit Index (PGFI) ≥ 0.60; Parsimony Comparative Fit Index (PCFI) ≥ 0.60; Root Mean Error of Approximation (RMSEA) ≤ 0.05; and Modified Expected Cross Validation Index (MECVI), the lower the better⁽¹³⁾.

The quality of local adjustment was identified based on the values of the factor loads ($\lambda > 0.3$)⁽¹⁷⁾ and individual reliability ($R^2 \geq 0.25$)⁽¹³⁾. The model was re-specified based on the modification index greater than 11 ($p < 0.001$), considering the theory and the correlation values; they were classified as weak ($0 < r < 0.3$), moderate ($0.3 \leq r < 0.5$) and strong ($r \geq 0.5$), considered significant when $p < 0.05$ ⁽¹⁸⁾.

RESULTS

Most were female (66.9%); were 70 to 80 years old (41.4%). had a partner (42.8%); had 1 to 5 years of study (52.4%); had an individual monthly income of 1 to 3 minimum wages (85.8%); and lived with a partner (81.1%) (Table 1).

Table 1 - Frequency distribution of sociodemographic variables of elderly residents in the Uberaba Health Microregion, Minas Gerais, Brazil, 2020

| Variables | n | % |
|---|-----|------|
| Sex | | |
| Male | 317 | 33.1 |
| Female | 640 | 66.9 |
| Age group (years) | | |
| 60 - 70 | 358 | 37.4 |
| 70 - 80 | 396 | 41.4 |
| 80 and older | 203 | 21.2 |
| Marital Status | | |
| Single | 63 | 6.6 |
| Common-law marriage | 410 | 42.8 |
| Widow(er) | 377 | 39.4 |
| Separated/divorced | 107 | 11.2 |
| Education (years) | | |
| None | 171 | 17.9 |
| 1 to 5 | 501 | 52.4 |
| 5 or more | 285 | 29.7 |
| Individual monthly income (minimum wages) | | |
| < 1 | 80 | 8.4 |
| 1 to 3 | 821 | 85.8 |
| ≥ 3 | 56 | 5.8 |
| Housing arrangement | | |
| Living alone | 181 | 18.9 |
| Living with other people | 776 | 81.1 |

Table 2 shows the socio-demographic characterization variables of elderly residents in the Uberaba Health Region (MG).

Analysis of the initial measurement model, proposed to describe how the six determinants of active ageing explain the correlational structure between the variables observed, Figure 1, did not present satisfactory indexes of quality of adjustment: $\chi^2/gf=5.92$; $p < 0.001$; GFI=0.85; CFI=0.73; TLI=0.69; PGFI=0.71; PCFI=0.65; RMSEA=0.07; PCLOSE < 0.001; and MECVI=2.57.

Figure 1 shows the standardized factor loadings and individual reliability of each of the items in the initial measurement model.

When considering the poor fit quality of the initial measurement model, it was re-specified. First, non-significant pathways were eliminated ($p > 0.05$), with a family history of CNCs \leftarrow personal determinants ($p=0.486$) and link to the health service \leftarrow social and health services ($p=0.069$). Afterwards, calculations of modification indexes greater than 11 were performed, which suggested the inclusion of correlations between the errors of the observed variables. To improve the fit of the measurement model, the variables observed with standardized factorial load (λ) less than 0.3 were excluded: anthropometric profile ($\lambda=0.12$); years of study ($\lambda=0.17$); paid work ($\lambda=0.20$); and access to continuous-use medicines ($\lambda=0.10$).

Then, non-significant correlations were suppressed, being: resilience \leftrightarrow depressive symptoms ($p=0.160$); safety \leftrightarrow means of transport ($p=0.090$); physical environment \leftrightarrow means of transport ($p=0.150$); security \leftrightarrow housing arrangement ($p=0.724$); social support \leftrightarrow leisure activities ($p=0.210$); AADL \leftrightarrow leisure activities ($p=0.224$); community activities \leftrightarrow leisure activities ($p=0.719$) and AADL \leftrightarrow community activities ($p=0.578$).

After the aforementioned modifications, the final measurement model, Figure 2, remained with good quality of adjustment: $\chi^2/gf=3.50$; $p < 0.001$; $GFI=0.94$; $CFI=0.92$; $TLI=0.90$; $PGFI=0.69$; $PCFI=0.73$; $RMSEA=0.05$; $PCLOSE=0.320$; and $MECVI=0.98$.

Figure 2 shows the standardized factor loads and the individual reliability of each of the items in the final measurement model and the correlations between the variables observed.

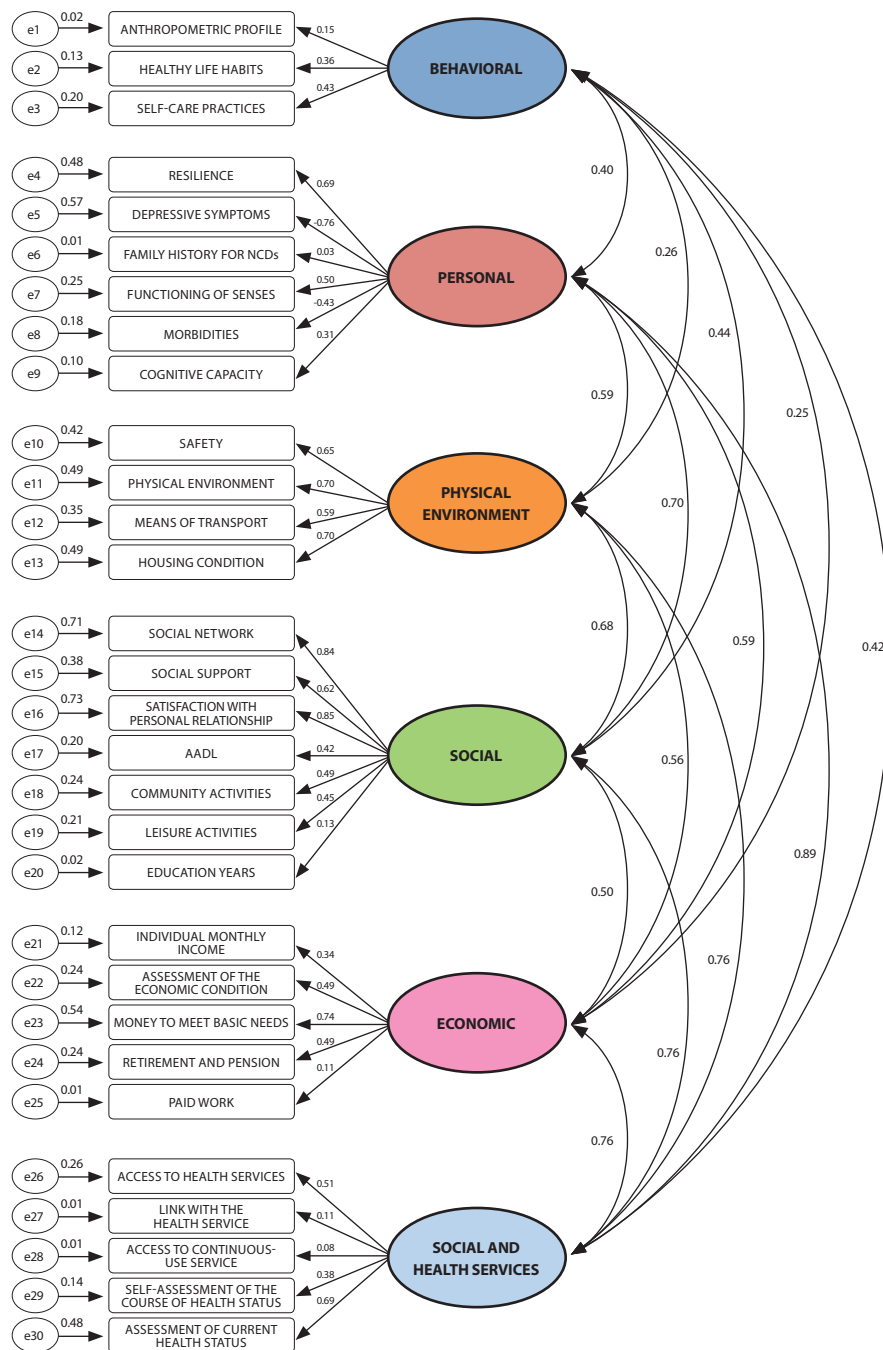
The Chi-squared difference test ($\Delta\chi^2$) between the initial and final measurement models ($[gf=168]$ $\Delta\chi^2=172.58$; $p < 0.05$) indicated that the final model showed better quality of fit and validity in study sample, as the MECVI value was considerably lower compared to the initial model.

Among the observed items of each of the six determinants, most of the correlations were of moderate to strong magnitude. In personal determinants, it was found that the higher the number of morbidities, the lower the resilience score ($r=-0.30$; $p < 0.001$) (Figure 2).

In the physical environment determinant, it was observed that the safer elderly individuals felt in relation to their daily life, the more they considered the physical environment to be healthy ($r=0.40$; $p < 0.001$). Moreover,

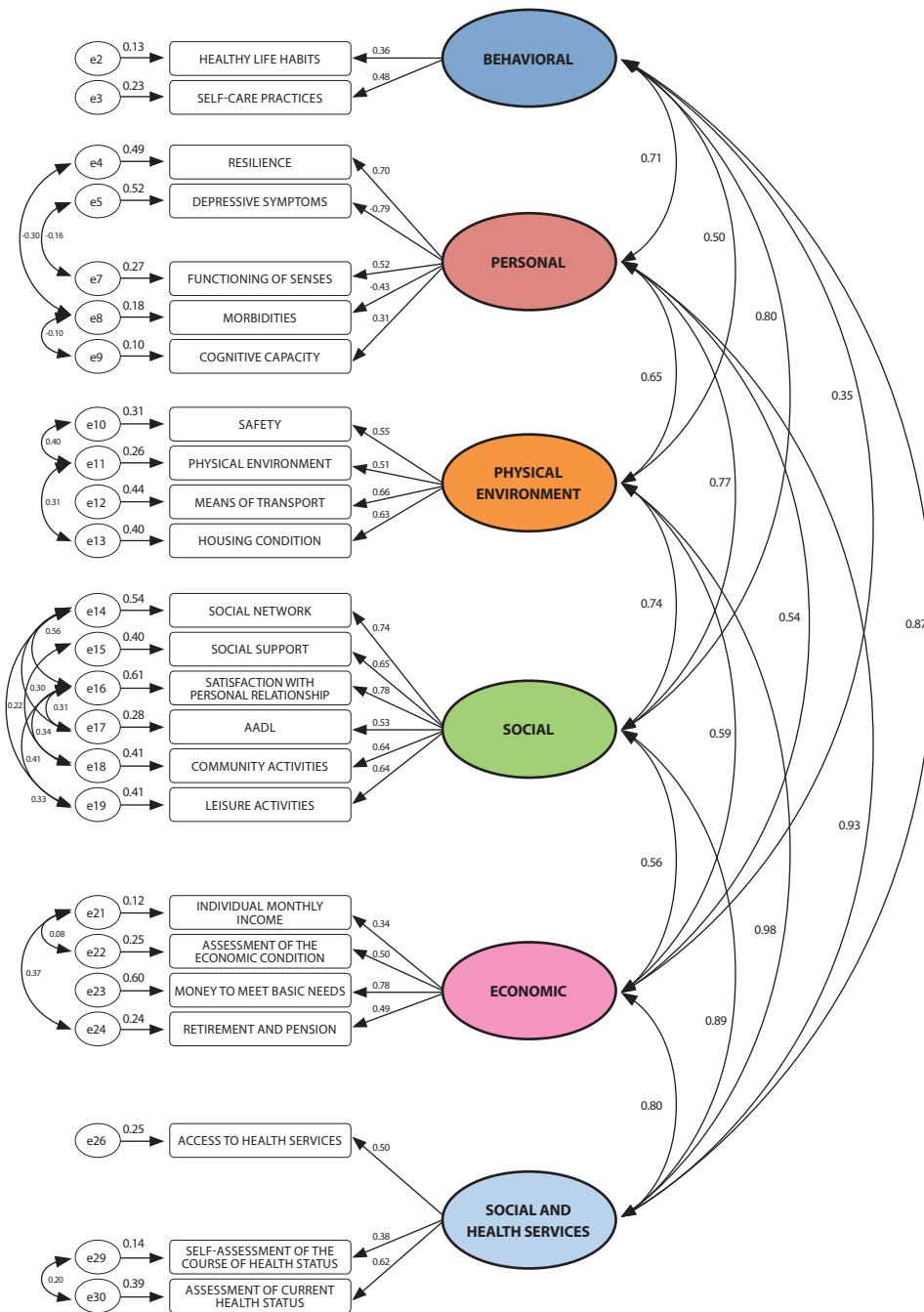
the healthier the physical environment, the more satisfied elderly individuals were with their housing arrangement ($r=0.31$; $p < 0.001$) (Figure 2).

In social determinants, the more satisfied elderly individuals was with their personal relationships, the greater the opportunities for leisure activities ($r=0.41$; $p < 0.001$); satisfaction with community activities ($r=0.34$; $p < 0.001$); participation in AADL ($r=0.31$; $p < 0.001$); and the social support network ($r=0.56$; $p < 0.001$) (Figure 2).



Note: AADL – Advanced Activities of Daily Living; χ^2/gf - Chi-square and degrees of freedom; GFI - Goodness of Fit Index; CFI - Comparative Fit Index; TLI - Tucker-Lewis Index; $PGFI$ - Parsimony Goodness of Fit Index; $PCFI$ - Parsimony Comparative Fit Index; $RMSEA$ - Root Mean Error of Approximation; $MECVI$ - Modified Expected Cross Validation Index.

Figure 1 - Initial measurement model: active ageing among elderly residents in the Uberaba Health Microregion, Minas Gerais, Brazil



Note: AADL – Advanced Activities of Daily Living; χ^2/gf – Chi-square and degrees of freedom; GFI – Goodness of Fit Index; CFI – Comparative Fit Index; TLI – Tucker-Lewis Index; PGFI – Parsimony Goodness of Fit Index; PCFI – Parsimony Comparative Fit Index; RMSEA – Root Mean Error of Approximation; MECVI – Modified Expected Cross Validation Index.

Figure 2 - Final measurement model: active ageing among elderly residents of the Uberaba Health Micro-region, Minas Gerais, Brazil

With regard to economic determinants, the highest income was related to the fact that elderly individuals are retired and/or pensioner ($r=0.37$; $p < 0.001$) (Figure 2).

Concerning social and health services determinants, a weak and positive correlation was identified between self-assessment of the course and current health status ($r=0.20$; $p < 0.001$) (Figure 2).

There was a proportional relationship between the determinants of active ageing, since the correlations were positive and of strong magnitude, except between the behavioral and economic determinants ($r=0.35$; $p=0.001$) (Figure 2).

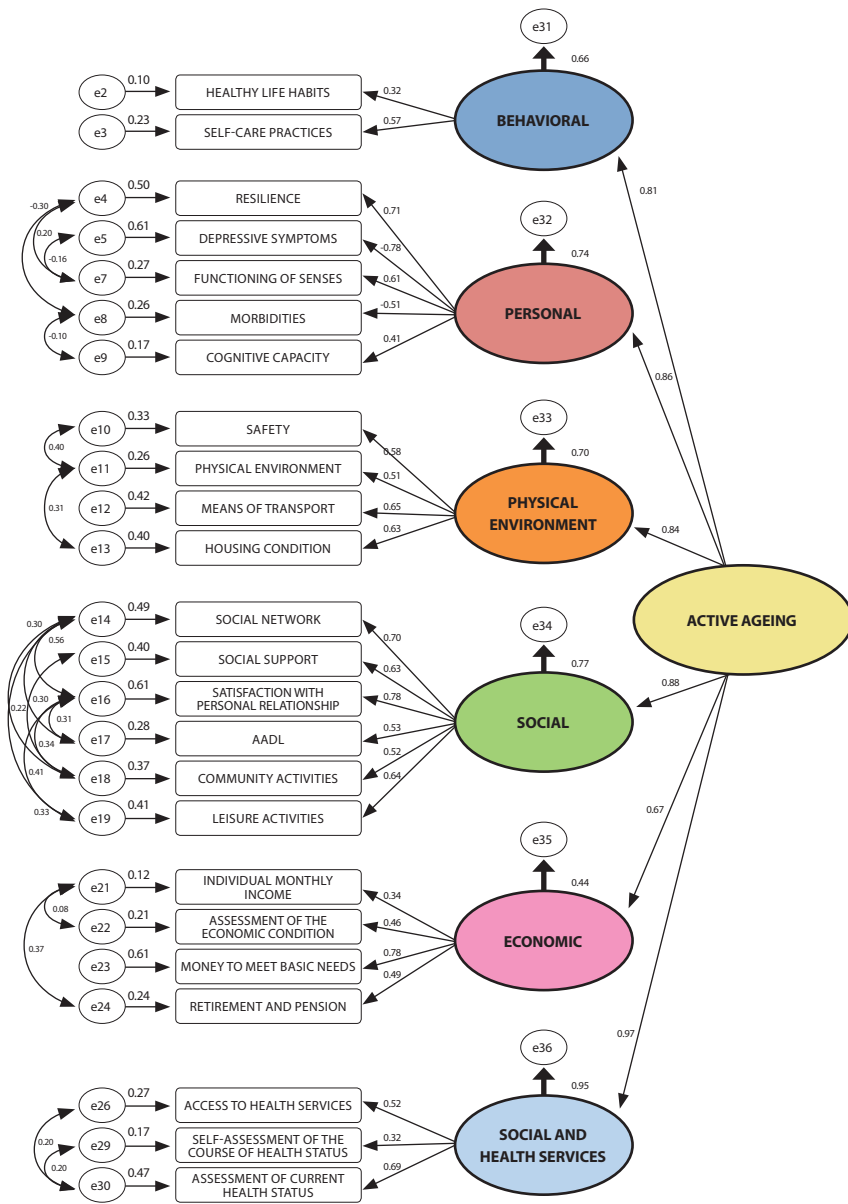
Considering the strong and statistically significant correlations among the six determinants of active ageing and based on the theoretical framework of the theme under study, a second-order factor called active ageing was defined (Figure 2).

After the insertion of the 2nd order factor, modification index calculations greater than 11 were performed, which suggested the inclusion of correlations between the observed variables, namely: resilience ↔ functioning of the senses ($r=0.20$; $p < 0.001$), i.e., the higher the resilience score, the better assessment of the functioning of the senses including hearing, sight, taste, smell and touch; social network ↔ activities in the community ($r=0.30$; $p < 0.001$), indicating that the larger the social network, the more satisfied elderly individuals were with participation in community activities; and access to health services ↔ assessment of current health status ($r=0.20$; $p < 0.001$), i.e., the greater the satisfaction with access to health services, the better the self-assessment of current health status (Figure 3).

It was found that the model remained with good quality of adjustment: $\chi^2/gf=3.50$; $p < 0.001$; GFI=0.93; CFI=0.91; TLI=0.90; PGFI=0.71; PCFI=0.75; RMSEA=0.05; PCLOSE=0.318 and MECVI=0.99. The *sk* and *ku* values of the observed variables, which remained in the final measurement model, are in accordance with the normality parameters. Most items had $\lambda > 0.3$ and individual reliability $R^2 \geq 0.25$ (Figure 3).

By analyzing the trajectories between the six determinants of active ageing and the 2nd order factor, greater relevance was found in social and health services ($\lambda=0.97$; $p < 0.001$). In other words, satisfaction with access to health services, as well as positive self-assessment of health and its evolution throughout one year, were the main factors associated with active ageing (Figure 3).

Figure 3 shows the standardized factorial loads and the individual reliability of each item of the CFA 2nd order model and the correlations between the variables observed.



Note: AADL - Advanced Activities of Daily Living; χ^2/gf - Chi-square and degrees of freedom; GFI - Goodness of Fit Index; CFI - Comparative Fit Index; TLI - Tucker-Lewis Index; PGFI - Parsimony Goodness of Fit Index; PCFI - Parsimony Comparative Fit Index; RMSEA - Root Mean Error of Approximation; MECVI - Modified Expected Cross Validation Index.

Figure 3 - Confirmatory factor analysis 2nd order model: active ageing among elderly residents of the Uberaba Health Microregion, Minas Gerais, Brazil

DISCUSSION

An active ageing model for elderly community members was proposed, based on the WHO theoretical framework⁽⁷⁾. In short, it was found that the model composed of the six determinants showed an appropriate adjustment for this age group. Social and health services determinants, which involve satisfaction with access to health services and positive self-assessment of health status, were the factors that most contributed to active ageing.

Promoting active ageing has been considered one of the main strategies to face the challenges caused by the population ageing process⁽⁷⁾. No studies were found that verified the applicability of the active ageing model⁽⁷⁾ in the elderly Brazilian population,

through the analysis of SEM. However, cross-sectional studies, which adopted the active ageing model proposed by the WHO as a theoretical framework^(5,9-10,33), sought to develop an instrument for measuring the determinants of active ageing, validated for its content^(5,9); to create an active ageing indicator⁽¹⁰⁾; and to verify differences between sexes^(10,33).

Divergent data from the current investigation was identified in international research conducted in Portugal^(8,11) and Canada⁽¹²⁾. The structural models of active ageing, developed based on the WHO theoretical framework⁽⁷⁾, did not present adequate indexes of quality of fit.

In the survey among Portuguese aged 55 and older⁽⁸⁾, an active ageing model was proposed, formed by health, psychological and bio-behavioral components, cognitive performance, social relationships and personality ($\chi^2=624.19$, $df=171$, $p<0.001$, $CFI=0.90$, $GFI=0.94$). The health determinant, composed of self-perceived health, presence of morbidities, functional capacity and lifestyle, was the main factor associated with active ageing⁽⁸⁾, a result different from that verified in the study. In the elderly population in the district of Castelo Branco, Portugal, the model consisted of six factors: psychological, subjective health, family relationships, functionality, satisfaction with services, and relationships with friends; the psychological component was the main determinant⁽¹¹⁾, data that differ from the present investigation.

The applicability of the active ageing model was also tested among elderly people in the community of Saint-Hyacinthe, Quebec and Kingston, Ontario, Canada. Contrary to the current research, the model did not present an adequate fit for the sample ($\chi^2=19.81$; $RMSEA=0.11$; $CFI=0.83$). The authors concluded that the concept of active ageing can be adequately modeled, but social participation and security did not fit the structural model⁽¹²⁾.

Based on the results of this study, it is possible to state that the active ageing process is influenced by several factors, which are interconnected and apply to the health of individuals⁽⁴⁾. Furthermore, due to variations between contexts and cultures, the active ageing model should be used to guide community policies⁽⁸⁾.

In recent years, there is a concern with the health conditions in which people are ageing, given that with advancing age, CNCs and functional disabilities become more frequent⁽³⁴⁾. In the current investigation, the greater the number of morbidities, the lower the resilience score. It is known that stressful situations in the elderly's life, such as living with comorbidities, make this

population more susceptible to negative feelings, which can affect their adaptation pattern, consequently, their resilience⁽³⁵⁾. A study carried out among individuals with CNCDs found that the longer duration of morbidity negatively influenced the resilience score ($p=0.014$)⁽³⁶⁾. Among elderly people with CNCDs, resilience can act as a tool for maintaining health and preventing complications; it can promote adequate motivation to adhere to self-care practices; and can allow the reduction of negative feelings that can generate losses for the control of these morbidities⁽³⁷⁻³⁸⁾.

In this context, knowledge of the relationships between these variables can provide support for the performance of the multidisciplinary team with elderly individuals in preventing injuries and rehabilitation and in planning guidelines for family members and caregivers⁽³⁹⁾. Thus, nursing professionals should add interventions, such as therapeutic groups, to a care plan for elderly individuals with CNCDs that provide increased resilience. To that end, determinant aspects of this construct need to be considered, such as the individual's own characteristics, support and social networks to assist in coping with stressors, and the environment in which elderly individuals are inserted^(4,37,40).

The relationship between the feeling of security and the positive assessment of the physical environment can be explained by the fact that often the perception that elderly individuals have of the environment in which they live is determined by the feeling of security and their social relationships⁽⁴⁾. The elderly individuals who feel insecure to go out, without opportunities to participate and deprived of mobilization due to the lack of an adequate urban structure, are more likely to be socially isolated and dissatisfied with their physical environment^(4,41-42).

Public and private spaces should encourage and promote active ageing, generating health, participation and safety conditions, in addition to being inclusive and accessible to the different needs of individuals⁽⁴³⁾. In contrast, elderly people with precarious housing arrangement, who live in risky environments with multiple physical barriers, are more prone to social isolation, depression, less physical preparation and mobility problems⁽⁴⁴⁾.

Housing is fundamental for the safety and well-being of people, constituting a pillar for the development of active and safe ageing in the community⁽⁴³⁾. Urbanization and the rapid population ageing process imply the need for action plans in order to guarantee accessibility for all⁽⁷⁾. Thus, it is essential to emphasize aspects of housing, health services, environment, education and opportunities for different age groups to establish links and integrate with the environment in which they live⁽⁴¹⁾.

Social interaction generated between elderly individuals develops a sense of well-being and improves physical functioning. In the current investigation, satisfaction with personal relationships was related to greater opportunities for leisure and community activities. Social relations, which are established with the continuous contact of elderly people with the environment in which they are inserted, can be protective and maintaining sources of health^(11,45).

Nevertheless, given the importance of social determinants in active ageing, it is up to health professionals to minimize the effects of the human ageing process through actions that expand support networks, contributing to the improvement of QoL, independence, autonomy and social participation of elderly population⁽⁴⁵⁾.

The higher income related to the fact of being retired and/or pensioner, corroborates the data from the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística*, abbreviated IBGE); 75.6% were retired and/or pensioners⁽³⁾. In this same age group, 69.0% of the financial resources came from retirement and/or pension. It is stated that the lower monetary vulnerability of elderly individuals and family members who make up their housing arrangement would be associated with receiving these benefits⁽³⁾.

Income determines the individual's options in relation to housing, food, education, health, among others. Worsen financial condition generates negative effects that persist throughout life and are reflected in the higher prevalence of CNCDs, functional limitations, psychological distress, and high mortality rates, with a negative impact on active ageing⁽⁴⁶⁾.

The social and health services determinant play an essential role in promoting active ageing, insofar as they must be integrated in a holistic perspective that contemplates health throughout the stages of life^(4,7). The challenge of population ageing in relation to health care occurs due to the close relationship between the use of health services and age. However, it is worth making a reservation, as elderly people with longer life expectancy and good health presented lower expenses with care in the accumulated number of years until death, compared to those in worse conditions⁽⁴⁷⁾.

Therefore, the health condition of individuals at 60 must be considered in the planning and development of the necessary care for the health of elderly individuals. Active ageing and good health cannot be expected when living in a society. In society, work is stressful and wages are not enough to meet the most basic needs; much of the daily time is spent on low-quality urban transport, with no time for leisure and child care⁽⁴⁷⁾.

Thus, the health of individuals can be socially determined⁽³⁴⁾. Health conditions should not be separated from life situations, as ageing will have an increasing effect on spending on health services, especially when there is a population that reaches old age with physical and mental problems, requiring long-term care⁽⁴⁷⁾.

Primary Health Care is essential for the proper monitoring of elderly individuals with chronic health problems. Primary Health Care promotes healthy behaviors, interferes with risk factors, conducts disease prevention and follow-up actions, aiming to monitor the course of the disease and the adequacy of treatment, to avoid the use of emergency and hospital units⁽³⁴⁾. Therefore, Family Health Strategies must be prepared to assist the changes brought about by demographic and epidemiological transitions, in search of knowledge and skills to serve an increasingly older population⁽³⁴⁾.

Access to health and social assistance influences demographic dynamics, with positive impacts on mortality and life expectancy, and can be considered a fundamental determinant of QoL⁽³⁴⁾. Thus, accessible and egalitarian social and health services are essential to promote health, prevent, treat and manage diseases as they occur, throughout life, preserving QoL⁽⁴⁾.

In short, it can be said that active ageing involves multifactorial aspects, and ensuring such aspects depends on the performance of all sectors of society, family and individuals themselves throughout their process of living and ageing⁽⁴⁾.

Study limitations

The exclusion of elderly people with severe cognitive impairment may have favored a healthier sample, however the possibility of selection bias was minimized, since all eligible elderly people were interviewed.

Contributions to nursing, health, and public policies

The findings reveal an expanded understanding of the factors that influence the active ageing process of elderly community members. Furthermore, it is worth noting that the current investigation is one of the first to use SEM analysis to test the applicability of the active ageing model, proposed by WHO⁽⁷⁾, in a sample of Brazilian elderly individuals. This research contributed to the advancement of knowledge regarding the methodology for active ageing assessment. Data were provided that could support the proposition of actions by both the multidisciplinary team and those specific to nursing for assessment and approach of elderly individuals and the development of public policies aimed at the organization of health care for this age group. Satisfaction with access to health services and positive self-assessment of health status were the factors that most contributed to active ageing in this population.

Regarding clinical nursing practice, assessment of the determinants of active ageing can be performed during the geriatric consultation to guide clinical judgment, contributing to the adoption of appropriate preventive and health promotion measures.

CONCLUSION

The active ageing model presented indicators compatible with an adequate adjustment among elderly individuals in the Uberaba Health Microregion (MG).

Concerning personal determinants, the presence of polymorbidity compromised the elderly's ability to adapt and cope in the face of adverse situations. Concerning physical environment determinant, the safer elderly individuals felt in relation to their daily life, the more they considered the physical environment as healthy, favoring satisfaction with the housing arrangement.

Regarding social determinants, the more satisfied elderly individuals were with their personal relationships, the greater the opportunities for leisure activities, satisfaction with community activities, participation in AADL and social support network. In relation to economic determinants, the highest income was related to the fact that elderly individuals were retired and/or pensioner.

The trajectories between the six determinants and the 2nd order factor, active ageing, were statistically significant. Social and health services determinants were more relevant, i.e., satisfaction with access to health services and positive self-assessment of health and its evolution over the course of a year were the factors that most contributed to a more active ageing.

The active ageing model, proposed in this study, can assist in planning actions directed to the context, in order to guide professional performance.

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