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Factors Contributing to Active Aging in Older Adults, from the Framework of Roy's Adaptation Model

Original article

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Factors Contributing to Active Aging in Older Adults, from the Framework of Roy's Adaptation Model

Objective. To determine the variables contributing to the explanation of active aging according to Roy's adaptation model. **Methods.** Descriptive correlational study, with convenience and snowball sampling. Two hundred older adults with chronic disease, were included. The instruments used were: a) Yesavage's Geriatric depression scale, b) Pheiffer's mental state questionnaire, c) basic activities of daily living, d) instrumental activities of daily living, e) Hope scale, f) coping mechanism items from the Successful Aging Inventory (coping with aging), g) hours of volunteer work, and h) The Duke-UNC Functional Social Support Questionnaire. Coping with aging was composed of independence in basic and instrumental activities of daily living, free from symptoms of depression, good mental state, and perception of health as good. Data were analyzed by using descriptive and inferential statistics, and simple and multiple linear regression models. **Results.** Fifty one percent of the participants showed active aging (42%

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men, and 56% women). Of the proposed variables, the variables showing effect on the variables of active aging, in the generalized linear model, were years of suffering the disease (Λ=0.922; p=0.008), coping with aging (Λ=0.582; p=0.001), and perceived social support (Λ=0.885; p=0.001). These three variables explained 5% of basic activities of daily living, 41% of the instrumental activities, 12.5% of health perception, 26% of mental state, and 21% of depression. Hope, and volunteer work were not significant. When the variables of active aging were dichotomized, age showed negative effect on global active aging and coping with aging positive effect. **Conclusion.** Although, proposed variables explained individually active aging, only coping with aging explained global active aging.

Descriptors: healthy aging; psychologic adaptation; depression; activities of daily living; social support; chronic disease; nursing theory.

Factores que contribuyen al Envejecimiento Activo en los adultos mayores, desde el marco del Modelo de Adaptación de Roy

Objetivo. Determinar las variables que contribuyen a la explicación del envejecimiento activo de acuerdo con el modelo de adaptacion de Roy. **Métodos.** Estudio descriptivo correlacional; se hizo muestreo por conveniencia y bola de nieve. Se incluyeron 200 adultos mayores. Se utilizaron los instrumentos: a) escala geriátrica de depresión de Yesavage, b) cuestionario de estado mental de Pfeiffer, c) Actividades básicas de la vida diaria, d) Actividades instrumentales de la vida diaria, e) escala de esperanza, f) reactivos de mecanismos de afrontamiento del inventario de Envejecimiento exitoso (afrontamiento al envejecimiento), y g) el cuestionario de apoyo social Duke-UNC-11. El envejecimiento activo se conformó por independencia en las actividades básicas e instrumentales de la vida diaria, libre de síntomas de depresión, buen estado mental y percepción de salud buena. Los datos se analizaron a partir de estadística descriptiva e inferencial, y modelos de regresión lineal y múltiple. **Resultados.** El 51% de los participantes mostró envejecimiento activo (42% en hombres y 56% en mujeres). De las variables propuestas, el modelo lineal generalizado mostró que los años de padecer la enfermedad, (Λ=0.922; p=0.008), el afrontamiento al envejecimiento (Λ=0.582; p=0.001), y el apoyo social percibido (Λ=0.885; p=0.001), presentaron efecto sobre las variables que conformaron el envejecimiento activo. Estas tres variables explicaron el 5% de las actividades de la vida diaria, 41% de las instrumentales, 12.5% de la percepción de salud, 26% del estado mental y el 21% de la depresión. La esperanza y trabajo voluntario no fueron significativas. Al dicotomizar las variables del envejecimiento activo se encontraron efectos negativos de la edad y positivos del afrontamiento al envejecimiento. **Conclusión.** Aunque en

este estudio se encontró que las variables propuestas explican en forma individual las variables del envejecimiento activo, solamente el afrontamiento al envejecimiento explicó la varianza del envejecimiento activo en forma global.

Descriptores: envejecimiento saludable; adaptación psicológica; depresión; actividades cotidianas; apoyo social; enfermedad crónica; teoría de enfermería.

Fatores que contribuem ao Envelhecimento Ativo nos adultos maiores, desde o marco do Modelo de Adaptação de Roy

Objetivo. Determinar as variáveis que contribuem à explicação do envelhecimento ativo de acordo ao modelo de adaptação de Roy. **Métodos.** Estudo descritivo de correlação, se fez amostragem por conveniência e bola de neve. Se incluíram 200 adultos maiores. Se utilizaram os instrumentos: a) escala geriátrica de depressão de Yesavage, b) questionário de estado mental de Pfeiffer, c) Atividades básicas da vida diária, d) Atividades instrumentais da vida diária, e) escala de esperança, f) reativos de mecanismos de afrontamento do inventário de Envelhecimento de sucesso (afrontamento ao envelhecimento), e g) o questionário de apoio social Duke-UNC-11. O envelhecimento ativo se conformou por independência nas atividades básicas e instrumentais da vida diária, livre de sintomas de depressão, bom estado mental e percepção de boa saúde. Os dados se analisaram através de estatística descritiva e inferencial, e modelos de regressão lineal e múltipla. **Resultados.** 51% dos participantes mostrou envelhecimento ativo (42% em homens e 56% em mulheres). Das variáveis propostas o modelo lineal generalizado mostrou que os anos de padecer a doença, (Λ=0.922; p=0.008), o afrontamento ao envelhecimento (Λ=0.582; p=0.001), e o apoio social percebido (Λ=0.885; p=0.001), apresentaram efeito sobre as variáveis que conformaram o envelhecimento ativo. Estas três variáveis explicaram 5% das atividades da vida diária, 41% dos instrumentais, 12.5% da percepção de saúde, 26% do estado mental e 21% da depressão. A esperança, e trabalho voluntário não foram significativas. Ao classificar as variáveis do envelhecimento ativo se encontrou efeito negativo da idade e positivo do afrontamento ao envelhecimento sobre o envelhecimento ativo global. **Conclusão.** Embora neste estudo se encontrou que as variáveis propostas explicam em forma individual as variáveis do envelhecimento ativo, somente o afrontamento ao envelhecimento explicou a variável do envelhecimento ativo em forma global.

Descritores: envelhecimento saudável; adaptação psicológica; depressão; actividades cotidianas; apoio social; doença crônica; teoria de enfermagem.

Introduction

Aging of the population is among the phenomena of greatest impact globally during the 21st century. The increase of people 60 years old and older is partly due to birth control and increased life expectancy at birth. Projections indicate that by 2050, one in every five inhabitants in the planet will be an older adult, with the rate in Latin America being one in every four.[1] In Mexico, according to the National Institute on Statistics and Geography, in 2014,[2] this age group was 9.3% of the total population with a tendency to increase the proportion, as in the rest of the world. It is known that aging is associated to social, economic, and – especially – health difficulties, which affect older adults, and those around them, including society and its governments.

Consequently, one of the biggest challenges for countries is to achieve better results in the older population, and to live in the best possible manner, independently, the longest time possible even in the presence of chronic diseases. In that sense, the World Health Organization (WHO)[3] promotes active aging to optimize health opportunities, participation, and security to improve quality of life as people age. Active aging implies continuous participation of the older adults in social, economic, cultural, spiritual, and civic matters, and not only the capacity to be physically active or participating in the workforce. Hence, active aging involves adaptation as challenges are faced. The WHO adds that people suffering from any disability or disease are not exempt from continuing to participate actively with their families.[3] In Mexico, the chronic diseases with the highest prevalence are arterial hypertension, diabetes mellitus type 2, and heart disease. In the state of Tamaulipas (Mexico), the first place is taken by diabetes, followed by ischemic heart disease, arterial hypertension, and cancer.[4]

Accepting the changes that emerge during aging implies a series of adaptations by the older adult, such as modifications of health behaviors and, at the same time staying socially connected.[5] Nursing can help older adults to face aging well, particularly those enduring chronic diseases. In countries like Mexico, active aging constitutes a need to preserve independence and delay disabilities in older adults , including those with chronic diseases.[5] According to Roy, the objective of nursing is to promote adaptation around a state of well-being in human beings. Thus the, Roy's Adaptation Model (RAM) was considered adequate to guide this study regarding factors that favor active aging, considered as adaptation.[6]

Roy[6] describes the person or human system as a holistic being with interdependent parts that function as a unit with a given objective. As a system, it responds to internal and external stimuli processed through coping subsystems called regulator and cognator. The ability to respond positively to environmental changes, as in this case due to aging, is a function of the level

of adaptation of the human system influenced by the demands of the situation, and the person's internal resources.

The internal and external stimuli called focal, contextual, and residual stimuli activate coping processes, regulator and cognator which in turn, produce responses in the physiological, self-concept, role function, and interdependent modes. When these responses are adaptive, they promote the person's integrity (adaptation of active aging); on the contrary, ineffective responses do not contribute to the person's integrity. Focal stimuli refer to those stimuli demanding attention and energy from the person at a given moment. In this study, chronic disease represented the focal stimulus by considering that disease imposes care derived from the treatment, that demands the attention from the patient. Contextual stimuli are those that although present in a given situation, do not demand energy and immediate attention from the individual, but do contribute to the effect of the focal stimulus and influence upon the situation.[6] This study proposed hope and sociodemographic variables as contextual stimuli; given that the literature indicates that hope is a precursor of effective coping and decision making,[7] as in this case in treating the disease and of active aging.

For chronic diseases, like diabetes mellitus type 2 and arterial hypertension, a balanced and healthy diet, and engaging in physical activity or exercise are recommended as part of their treatment, thus they were considered as contextual stimuli. At the same time, age, schooling, and gender can influence upon the decisions made by the older adult with chronic disease, so they were also contextual stimuli.

Residual stimuli are those stimuli whose effects in a given situation are not clear to the person; an example is fear. Roy indicates that when the stimulus becomes clear to the individual, it is no longer residual. Hence, this concept was not studied. The regulator and cognator are the subsystems capable of modifying the levels of adaptation. Roy[6] defines coping processes as innate or acquired ways of responding to the changing environment, that is, to stimuli. In that sense, Roy states that stimuli from the internal and external environment act as inputs to the human system to produce a response. The cognator subsystem responds through four cognitive-emotional channels: perception and processing of information, learning, judgment, and emotion.

Troutman *et al.*[8] formulated a theory on successful aging based on Roy's coping processes and subsequently developed and tested the successful aging inventory. In her theory the effective use of coping mechanisms permit the person to age successfully. Based on these statements, two of Troutman's coping mechanisms were renamed as coping to aging. Responses to stimuli and processed by the regulator and cognator subsystems are manifested in four modes: physiological, self-concept, role function, and interdependence. The physiological mode refers to the manifestations of the cells, tissues, organs, and systems of the human body, according to five basic needs and four physiological processes. This concept was not used in this study. The self-concept is defined as the beliefs and feeling one holds about oneself at a given moment and it is formed through one's perceptions and that of others, on the physical and personal self. This concept was also not used.

The response of the role function mode refers to the series of expectations on how a person performs while occupying a given position. Roy[6] describes the primary, secondary, and tertiary roles. The primary role refers to what a person expects to accomplish. The secondary role refers to the achievement of expectations according to a given stage of development and includes the primary role; the theorist describes it as the series of tasks to perform as spouse, father, mother, teacher, among others. The tertiary role is freely chosen by the person and is generally temporary, such is the case of volunteer work. Social participation is a determining factor of active and healthy aging. A form of involvement or social participation is to voluntarily undertake actions in favor of others. The literature documents that offering one's time to serving others provides satisfaction to those who serve; whether by carrying out household chores,

running errands, caring, or sharing knowledge, that is, volunteer work.[9] This type of work has also been linked to the wellbeing and quality of life in older adults.[10] This activity implies staying physically and cognitively active; working for others increases self-esteem and security in oneself, and favors social relationships,[10] which is why volunteer work represented Roy's tertiary role.

The aging process, treatment and care of chronic disease are best endured when the older adult receives support from his or her family and friends. [11] The interdependence mode refers to the interactions related to giving and receiving love, respect, and worth. The social support perceived by the older adult regarding aid, love, and respect from their family and friends represented the interdependence mode. Finally, the general adaptation defined as "the process and result through which people with the capacity to think and feel opt consciously to become integrated with their environment",[6] was represented by active aging. Active aging comprised physical independence, interaction with their environment, cognitively alert, free of symptoms of depression, and good or excellent health perception in spite of suffering from chronic disease. Which is why, based on the literature review and the guide of Roy's Adaptation Model, we sought to study if chronic disease as focal stimulus, hope and sociodemographic variables as contextual stimuli, coping with aging as cognator, and adaptive responses represented by volunteer work, and perceived social support explain active aging (cognition, independence, free from symptoms of depression, and good health perception) in a sample of older adults in Matamoros, Tamaulipas (Mexico).

Methods

This was a cross-sectional, descriptive and correlational study conducted in the city of Matamoros, Tamaulipas (Mexico), with non-probabilistic convenience and snowball sampling. The participants were recruited through co-worker reference at Universidad Autónoma in Tamaulipas.

The sample size was estimated through the nQuery Advisor package version 4, for a multiple linear regression model with eight variables and the following criteria: 0.05 significance level, effect size between medium and large of 0.12, and 90% power, resulting in 200 participants.

Participants were included as older adults who were 60 years of age and over, had a chronic disease diagnosed more than one year before, were oriented in place, time, and space, and who were capable of hearing the interviewer's voice. The study exclude older adults with visible difficulty in walking.

A list was drawn of the possible participants suggested by the university coworkers of the first author; thereafter, they were invited to participate through a telephone call during which they were explained the aim of the study; inclusion and exclusion criteria were corroborated through simple questions, like: what is your name, what day is today, where are we, and do you suffer from any disease. Data was gathered from August to November 2016 in the homes of the participants, who signed an informed consent. At completion of the instruments, they were thanked for their participation and were asked if they knew of someone or a relative who could also participate.

For data collection, a sociodemographic data sheet was used and several instruments. According to Roy's model, the adaptation was represented by active aging, a term that refers to older adults who fend for themselves, without symptoms of depression, cognitively alert, and who perceive their health as good or excellent for which the following scales were used: Katz's index of basic daily living activities,[12] Lawton's index of instrumental daily living activities,[13] geriatric depression scale (GDS-5 short version),[14] Pfeiffer's mental state short questionnaire,[15] and a question on the perception of their health with four response options: excellent, good, regular, and poor from 1 to 4 points.[16]

The index of basic activities of daily living (ADL) evaluates people's degree of independence/dependence in six basic functions: bathing,

dressing, using the toilet, mobility, continence, and feeding. If independent, 1 point is assigned in each item; if help is needed, 0.5 point is assigned; and if dependent, 0 point is assigned. The total score can range from 0 to 6 points, higher scores meant greater independence. For active aging, participants who obtained 6 points were considered independent.

The index of instrumental activities of daily living (IADL) evaluates physical autonomy, it contains eight items (capacity to use the telephone, go shopping, food preparation, house chores, laundry, use transportation vehicles, responsibility with respect to medication, and administration of their economy). Each item was assigned a value of 1 = independent, 0 = dependent. The final score ranges from 0 to 8 points, higher scores mean greater independence. For male participants, the study excluded questions related with food preparation, house chores, and doing laundry; the score for men ranged from 0 to 5 points, and for women from 0 to 8 points, dependent and independent, respectively. For purposes of active aging, 8 points were considered for women and 5 points for men.

The geriatric depression scale, GDS-5 short version, quantifies symptoms of depression in older adults, centered on cognitive behavioral aspects. The response pattern is dichotomous 0 and 1, if the response suggests a depression episode it is scored with 0, on the contrary it is assigned 1 point. The score ranges from 0 to 5 points, higher scores mean less symptoms of depression. This study considered as free from depression a score equal to or higher than 4 points.

Pfeiffer's mental state short questionnaire assesses cognitive impairment through 11 items. It is evaluated in terms of errors: 0-2 errors, the score ranges from 11 to 9 points and is considered normal; 3-4 errors, the score is 8 to 7 points and it is equivalent to slight cognitive impairment; 5-7 errors is equal to 6 to 4 points, meaning moderate cognitive impairment; and 8-10 errors corresponds to 3 to 1 points, which indicates severe cognitive impairment. Active aging was considered when a score from 9 to 11 points was obtained.

In summary, active aging was considered with the following cut-off points: ADL = 6 points, IADL = men (5) and women (8), free from symptoms of depression = 4-5 points, good mental state = 9-11 points, and health perception = 3-4 points.

Hope refers to positive feelings and beliefs with respect to their future and it was measured with the Herth Hope Index, composed of 12 items, with a Likert-type response format from 1 to 4 points, varying from "totally disagree" = 1, to "totally agree" = 4. Values of reactions 3 and 6 are negative assertions, which are transformed to preserve the positive sense. The total score varies from 12 to 48, a higher score denotes a higher level of hope.[17]

Coping with aging was defined as the capacity of the older adult of accepting and dealing with physical changes, life events, carrying out activities, and able to perform house chores. It was measured using the coping mechanisms items of the successful aging inventory.[8] The SAI was developed for people 65 years of age and over, with eight items of which only five those related to coping were used; general reliability with Cronbach's alpha reported was 0.86.[18] The SAI was translated into Spanish and a Cronbach's alpha of 0.85 was obtained for these five questions: 1) I have been able to face the changes occurring in my body as I have aged; 2) I feel capable of facing my own aging; 3) I feel capable of facing life's events; 4) I can solve problems; and 5) I am good at finding new ways of solving problems. The answers used a Likert-type format ranging from 1 = almost never to 5 = almost always. The scores range between 5 and 25 points, higher scores meant better coping with aging.[19]

Perceived social support assesses perception of the older adult of aid, affect, and trust received from relatives, friends, and neighbors.[20] It was measured through the *Functional Social Support Questionnaire (Duke-UNC-11).* It has 11 questions with a Likert-type format with five response options, ranging from 1 (much less than what I desire/want) to 5 (as much as I desire/

want), estimating that affective social support exists if a minimum of 18 points is obtained and confidence of at least 15 points.[21]

Volunteer work comprised activities and time offered freely by people at the service of others, without economic reward. This was measure through 11 activities taken from the National Survey on the Use of Time,[22] which asked about activities done for others, like sweeping the sidewalk, gardening, driving or waslking children to school, shopping, as well as religious activities, community, educational, and cultural services in institutions, and caring for grandchildren, relatives, and transfers to the doctor's office. The response options went from 0 = never, 1 = once per week, 2 = twice per week, 3 = three or more times, and 4 = every day, related to the frequency of volunteer work, higher scores meant greater volunteer work. The scores ranged from 0 to 44 points, higher scores indicate more time of volunteer work. In each affirmative activity, the participants were asked for the time in minutes per week dedicated to that activity.

The study was approved by the ethics and research committees of the Faculty of Nursing at Universidad Autónoma de Nuevo León (Registry Nº: FAEN-D-912). The ethical considerations of the study included the recommendations by the Regulation of the General Health Legislation on Research, with respect to the dignity and rights of the participants, privacy, and signed consent.

Data was analyzed with the IBM SPSS statistical package version 20.0 for Windows. Descriptive and inferential statistics was used. The internal consistency of the instruments was evaluated through Cronbach's alpha. Frequency distribution of the variables was not normal; it was verified with the Kolmogorov-Smirnov test with Lilliefors significance correction. The Mann-Whitney U test was used to learn the difference of medians for years of study of the participants and variables implied for active aging; besides the variables proposed, simple, multiple, and generalized linear regression models were applied with the backward variable selection method and bootstrap technique with 200 samples and the non-standardized beta is reported. A logistic regression model was also applied to observe the effect of the variables of disease, hope, volunteer work and perceived social support on dichotomized active aging (ADL, IADL, mental state, health perception, and depression). The coefficients signs and confidence intervals of the multiple linear regression model and those of the bootstrap technique are similar, therefore we can assume that non normality of data was not a problem. To explore if coping with aging moderates between the contextual stimulus of hope and the adaptive modes of social support and volunteer work, simple and multiple linear regression models were run, following criteria by Baron and Kenny (1986). The following hypothesis was proposed: active aging is determined by age, chronic disease, hope, coping with aging, social support and hours of volunteer work.

Results

The results correspond to 200 older adults with a mean age of 68.9±7.6 years. Among the principal characteristics of interest, the following prevailed: (64.5%) corresponded to the female gender, one in every three was 70 years old and over, average schooling was 10.2±6.6 years of study, 54.5% lived with their partner, for 29% the favorite hobby was watching television and 34.5% helped in religious services; 98% had chronic noncommunicable disease (with most having arterial hypertension (43.5%) followed by type 2 diabetes and 23% had other diseases, like breast cancer, osteoarthritis, cardiovascular disease, and prostate problems), and 97.5% referred taking medications.

Regarding the median of the instruments, for hope was 87.8±12.1, coping with aging was at 84.0±17.2, perceived social support 73.3±19.8, without symptoms of depression 73.3±19.7, ADL 97.5±7.7, and IADL 92.2±18.9. The median of hours of volunteer work was 3.26± 5.06. Descriptive data are shown in Table 1.

Table 1. Frequency distribution of sociodemographic variables of 200 older adults

Characteristics	Frequency	%
Gender		
Female	129	64.5
Male	71	35.5
Age group		
60-69 years	121	60.5
70-79 years	61	30.5
80 years and over	18	9.0
Years of study		
0 years	14	7.0
1-14	122	61.0
+ 15	64	32.0
Marital status		
With partner	109	54.5
Without partner	91	45.5
Lives		
Alone	31	15.5
1 person	82	41.0
2 people	37	18.5
3 people	24	12.0
4-12 people	26	13.0
Favorite hobby		
Watching TV	58	29.0
Reading	28	14.0
Spending time with children/grandkids	23	11.5
Doing exercise/walking	21	10.5
Listening to music	17	8.5
Gardening/Handicrafts/ Dancing	30	15.0
Going on trips/travelling	8	4.0
Attending church/cooking/lottery	13	6.5
Did not know	2	1.0
Disease reported		
Hypertension	87	43.5
Diabetes	61	30.5
Diabetes/hypertension	25	12.5
Others	23	11.5
None	4	2.0
Volunteer work		
Participating in religious services	69	34.5
Shopping for others	44	22.0

Table 1. Frequency distribution of sociodemographic variables of 200 older adults. (Cont.)

Characteristics	Frequency	%
Volunteer work		
Taking care of grandkids	40	20.0
Sweeping the sidewalk for others	31	15.5
Gardening for others	10	5.0
Does not engage in volunteer work	6	0.3

For this study, the internal consistency using the Cronbach's alpha coefficents were: hope scale 0.85aging inventory 0.84, functional social support 0.88, geriatric depression scale 0.53, and mental state questionnaire 0.78 .

In the ADL, 89% (n=178), and in the IADL, 76.5% (n=153), classified as independent; 81% (n=162) had no symptoms of depression, and 94% (n=188) had good mental state. In relation to the health perception of the older adult, the category of excellent was reported by 21% (n=42), good by 60% (n=120), regular 16.5% (n=33), and poor by 2.5% (n=5).

Table 2 displays that 51% (n=102) of the participants classified for active aging, which was significantly higher in women (42.2%), in the age group from 60-69 years (67.7%) and in those with over 11 years of schooling (63.2%).

Table 2. Proportion of participants with active aging by gender, age group, and schooling

	Frequency	%	Probability value
Gender			
Male (n=71)	30	42.2	0.028
Female (n=129)	72	55.8	
Age group			
60-69 years (n=121)	82	67.7	<0.001
70-79 years (n=61)	15	24.6	
Over 80 years (n=18)	5	27.7	
Schooling			
0 - 11 years (n=94)	35	37.2	<0.001
12-14 years (n=106)	67	63.2	

To test the relations suggested by Roy's Adaptation Model and explain the variables implied in active aging, Figure 1 was drafted.

To verify the Roy's statement that the contextual stimulus contributes to the effect of the focal stimulus, a simple regression analysis was first run where the disease was the independent variable and coping with aging was the dependent variable. The disease showed tendency at 0.10 value [F (8, 191)=1.75, p=0.089] and R^2=0.029. When hope (contextual stimulus) was introduced into the equation, both variables become significant hope [F(1, 190) = 138.36, p <0.001]; disease [F(8, 190)= 2.43, p=0.016] and the explained variance increases to 43.5%. This result confirms that hope, contextual stimulus, modifies the effect of the focal stimulus, disease, on coping to aging.

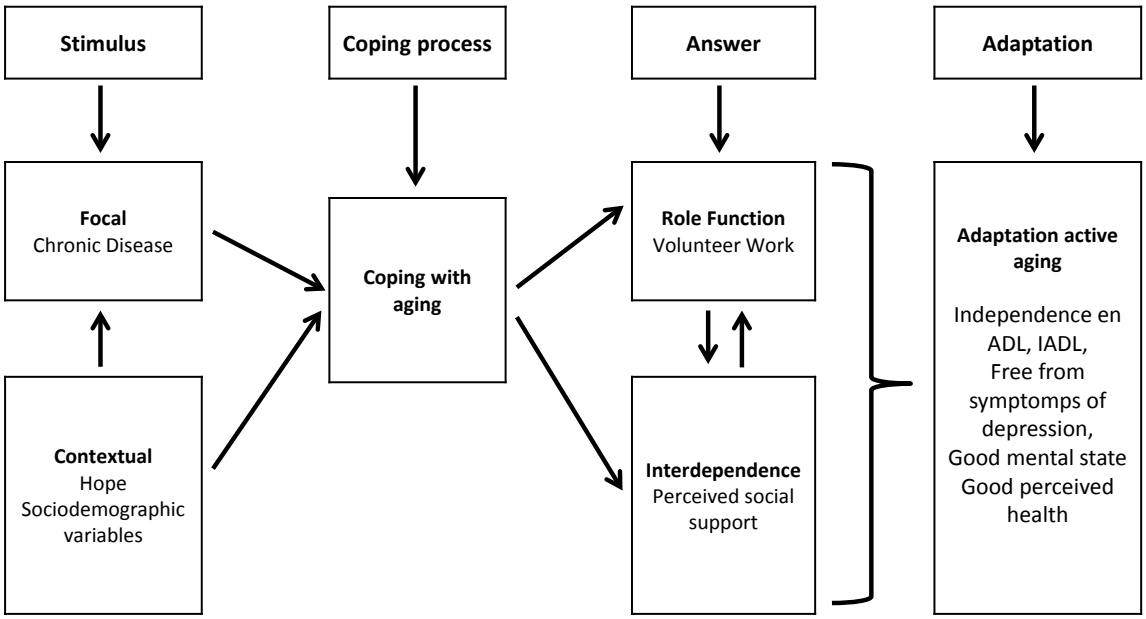

Figure 1. Representation of variables proposed in the model of coping and adaptation to active aging

To learn the effect of all the variables proposed on active aging, we first used the values (transformed to indices) of the variables that conformed active aging (Table 3) and, thereafter, active aging was dichotomized by using the cut-off points from each variable. The first case used a generalized linear model with all the variables implied. Indices of basic activities of daily living, instrumental activities, mental state, depression, and health perception were introduced as dependent variables, and years of enduring the disease, hope, coping with aging, perceived social support, and years of performing volunteer work were introduced as independent variables. The test of multivariate contrasts showed significant effect of of years of enduring the disease, coping with aging, and perceived social support. The three variables explained 5% of activities of daily living, 41% of the instrumental activities, 12.5% of perceived health, 26% of the mental state, and 21% of depression. Years with the disease affect negatively the mental state; more years with the disease meant greater number of errors. Coping with aging showed positive effect on all the variables that conformed active aging, and social support showed positive trend with the instrumental activities of daily living and negative effect on symptoms of depression. Hope and years of performing volunteer work showed no significant effect on the variables of active aging.

In the second case, and to respond to the proposed hypothesis if active aging is determined by age, chronic disease, hope, coping with aging, social support, and hours of volunteer work, eight logistic regression models were run with the backward method. The first model showed significant effect (χ^2=53.98, df 9, R^2=23.7%, p<0.001), age (B=-0.091, p=0.002) and only tendency of coping with aging (B=0.028, p=0.063). The variable with the highest p value was eliminated, which was hope, followed by social support, volunteer work, gender, years with the disease,

and schooling. In the last model (χ^2=42.59, df 2, p<0.001), age (B=-0.097, p=0.001) and coping with aging were significant (B=0.041, p=0.001) with 19.2% of explained variance on active aging. Age shows negative effect and coping with aging a positive effect on active aging. That is, older age indicated less probability of active aging, greater scores on coping with aging meant greater probability of aging actively (Table 4).

Furthermore, the study explored if coping with aging moderates between the contextual stimulus of hope and the adaptive modes of social support and volunteer work. First, hope was introduced as independent variable and coping with aging as dependent variable. The model shows that hope affects coping with aging [F(1,198), 135.16, p<0.001], with an explained variance of 40%, B=0.637. Upon introducing hope and coping with aging as predictive variables and social support as dependent variable, the model continues being significant [F(2,197), 14.67, p<0.001, R^2=12%]; the contribution of hope was B=0.18 and coping with aging was B=0.21. This confirms that hope, as contextual stimulus, affects coping and both (hope and coping) affect the perception of social support or the interdependence mode of Roy's Adaptation Model. Hope in the first step showed no significant effect on hours of volunteer work [F(1,198) = 0.581, p<0.447], which is why this analysis was not continued.

Table 3. Generalized linear model of years with disease, coping with aging, and social support on active aging

Multivariate contrasts	Λ	F	DF	DF error	*p* value
Intercept	0.844	207.71	5	192	<0.001
Years with disease	0.922	3.24	5	192	0.008
Coping with aging	0.582	27.58	5	192	<0.001
Perceived social support	0.885	5.97	5	192	<0.001

Test of inter-subject effects						
Origin	Scale	Sum of type III squares	DF	Mean Square	Frequency	*p* value
Years with the disease	Mental state	10.0	1	10.0	13.7	<0.001
Hope	Health perception	2.4	1	2.4	6.0	0.015
Coping	ADL	529.0	1	529.0	9.3	0.003
	IADL	12364.6	1	12364.6	57.3	<0.001
	Health perception	2.3	1	2.3	5.6	0.018
	Mental state	10.6	1	10.6	14.5	<0.001
	Depression	2878.0	1	2878.0	9.1	0.003
Social support	IADL	616.1	1	616.1	2.8	0.092
	Depression	5482.0	1	5482.0	17.4	<0.001

Note: ADL = basic activities of daily living, IADL = instrumental activities of daily living, DF= degrees of freedom, n=200

Table 4. Logistic regression model of hope, coping with aging, volunteer work, social support, age, gender, years of study, and years with disease on active aging

Variable	*B*	*SE*	Wald	*DF*	*OR*	*p*
Model 1*						
Constant	3.082	2.935	1.10	1	21.8	0.294
Hope	0.012	0.020	0.33	1	1.0	0.562
Coping with aging	0.028	0.15	3.46	1	1.0	0.063
Weekly volunteer work	-0.049	-0.034	2.15	1	0.9	0.142
Perceived social support	0.099	0.009	0.92	1	1.0	0.337
Age	-0.091	0.030	0.93	1	0.9	0.002
Gender	-0.479	0.361	1.76	1	0.6	0.184
Years of study	0.520	0.403	1.66	1	1.6	0.197
Has disease	-1.277	0.777	2.69	1	0.3	0.100
Model 8†						
Constant	3.169	2.226	2.02	1	23.7	0.155
Coping with aging	0.041	0.012	11.33	1	1.0	0.001
Age	-0.097	0.027	13.37	1	0.9	0.001

(*)χ^2=53.98, DF=9, R^2=23.7%, p<0.001; (†)χ^2= 42.59, DF=2, R^2=19.2%, p<0.001

Note: *B*=beta not standardized, *SE*= standard error, *DF*=degrees of freedom, *OR*=odds ratio, *n*=200

Discussion

Over half of participants adults classified in active aging, that is, were independent in ADL and IADL, had good mental state, were free of symptoms of depression, and perceived their health as excellent or good. Active aging represented the general adaptation that in Roy's terms represents the individual's integration and their environment. It means that the older adult with chronic disease fend for themselves for basic activities, like dressing, eating, using the bathroom, among others. With respect to instrumental activities, they can use the telephone, go shopping, and cook food, among others, activities that show that these older adults interact with their environment. Pfeiffer's mental state indicates that they are alert with their environment, for example knowing the day, and place where they are. Being free of depression indicates that the older adults continues encouraged and interested with things and people around him or her, as well as perceiving their health as good or excellent.

More women than men classified in active aging, contrary to that reported by other authors,[23] although measured through physical activity and not through daily living activities. In Mexico, women are responsible for tasks at home even if they have to work and men participate less in daily activities in the home. With respect to basic and instrumental activities activities of daily living, participants are mostly independent although in lower proportion in the instrumental activities, data that confirms results,[24] and similar to the literature, some women present problems of incontinence.[9] Only a fifth part reported symptoms of depression; both men and women in similar proportion, a result that agrees with studies conducted in Latin American older adults.[25]

Less than 10% had slight cognitive impairment, errors occurred mostly in the calculation and orientation of time, a fact that is documented[26]

However, this data must be taken with caution given that the sample was selected intentionally with high educational level and is not representative of the educational levels of Mexican older adults. The perception of good health obtained greater frequency and in higher proportion by women than men and in those with more years of studies, results that reaffirm previous reports.[27] This data is relevant if we consider that most suffered from at least one chronic disease.

The study confirmed Roy's postulate, contextual stimulus in this case hope, contributes to the effect of the focal stimulus in this case disease, on the situation or coping with aging. Hope protects against the stress generated by disease and enables individuals to reassess their situation, seek strategies, and get involved in health behaviors, which contribute to treating the disease and, in turn, contributes in the adaptation.[28]

The results suggests, that hope is a prerequisite for coping[7] and both variables influence upon the perception of social support as interdependence mode. However, the effect of hope and social support on active aging was lost, only coping with aging persists.

It was noted that time with the disease affects negatively the mental state, results that confirm reports by another author.[26] It is known that years of enduring diabetes mellitus impact negatively on cognitive functions, like memory, attention, executive functions, principally due to episodes of hypoglycemia of which this study did not inquire. Seemingly, aging with one or more diseases is to be expected and while such do not affect one's bodies physically or is not serious, these do not affect one's lives. A selection criterion of participants was that they suffered from some chronic disease; it may be necessary to include older adults free from disease. Coping with aging showed positive effect on all the variables that conformed active aging. In this study, coping with aging meant the capacity of the older adult to accept and deal with physical changes and life events. These results support that the cognator concept according to RAM.[6] Coping with aging turned out to be the strongest variable in this study, suggesting that active aging in these participants depends on their own capacity to face changes and challenges presented by aging. In that sense, different authors refer to such as an individual phenomenon and not depending on programs or facilities of the community.[23]

Social support showed a positive trend with the instrumental activities of daily living and negative effect on symptoms of depression. The interdependence mode represented by perceived social support complied with the assumption that behaviors or adaptive responses are a function of the stimuli and the adult's level of adaptation represented by coping processes.[6] Social support implies perceiving demonstrations of aid, affect, and trust by relatives, friends, and neighbors. The negative effect indicates that higher perceived social support yields less symptoms of depression. The importance of perceiving social support by older adults and its beneficial effects in relation to symptoms of depression has been documented by other authors.[20]

The association of perceived social support and coping with aging in this study was noted perhaps due to the possibility of communicating and sharing the problems of aging with the people who live with them and unloading negative emotions; more than 75% of the sample in this study lives with more than one person. Having someone close and living with him or her may help to face aging challenges.[23] Another strategy mentioned in the literature is the self-distraction of adults as positive reinforcement of social support and coping. In this regard, this study also inquired about the favorite hobbies of the older adults, their answers were quite diverse, but it seems that conducting activities different from the daily obligations and cultivating social relations favors coping.[23] With respect to relations guided by Roy's Adaptation Model to explain active aging, it may be said that chronic disease considered focal stimulus showed no effect on coping and the rest of the variables. The diseases reported most often were arterial hypertension and diabetes mellitus type 2; it may be necessary to study older adults with other types of chronic disease to establish their effect on active aging.

Study limitations included non-randomization in selecting the participants, not including objective indicators like glycosylated hemoglobin, foot sensitivity, and blood pressure among other tests. There were practically no participants without chronic disease, which is perhaps why it was not possible to establish differences between those with disease and those without.

This study concludes that hope modifies the effect of the disease on coping with aging. Time with the disease affects negatively the mental state; coping shows positive effect on the variables that conformed active aging, and social support showed positive relation with the instrumental activities of daily living and negative effect on symptoms of depression. Hope and years of performing volunteer work showed no significant effect on the variables of active aging. Coping with aging turned out to be the strongest variable in this study, which suggests that active aging in these participants depends on their own capacity to face changes and challenges presented by aging and disease. More than half of the participants showed active aging in spite of chronic disease. Nursing can promote strategies for older adults to remain active.

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