Cognitive Impairment and Anxiety in Older Adults: Characterizations in a High Southern Latitude Population

Deterioro cognitivo y ansiedad en adultos mayores: caracterizaciones en una población de latitudes altas del sur

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Abstract

Objective. The study characterized the levels of anxiety and cognitive impairment of older people in the Chilean city of Punta Arenas, exploring possible correlations between both phenomena.

Methods. With a descriptive pilot design, 72 older people (60-87 years) residing in Punta Arenas were evaluated using the Beck Anxiety Inventory (BAI) and Montreal Cognitive Assessment (MoCA) tests to measure anxiety and cognitive impairment, respectively.

Results. Women were found to have significantly higher BAI scores than men (9,0 vs 3,5; p = 0,025), without significant differences in MoCA by sex. BAI and MoCA total scores showed an inverse correlation. Those over 70 years of age had a greater probability of altered scores in BAI, and a non-significant trend in MoCA (OR: 2.43; p = 0.066). Men showed higher rates of cognitive deterioration than women, although without statistical significance.

Conclusion. Those over 70 years of age showed a greater probability of altered anxiety and a non-significant trend toward greater cognitive deterioration. The results underscore the need for specific interventions to improve mental and cognitive health in this vulnerable population.

Keywords

Anxiety; cognitive impairment; elderly person; psychology; high latitude.

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Resumen

Objetivo. El estudio caracterizó los niveles de ansiedad y deterioro cognitivo de las personas mayores de la ciudad chilena de Punta Arenas, explorando posibles correlaciones entre ambos fenómenos.

Métodos. Con un diseño piloto descriptivo, se evaluaron 72 personas mayores (60-87 años), residentes en Punta Arenas, mediante las pruebas Beck Anxiety Inventory (BAI) y Montreal Cognitive Assessment (MoCA) para medir ansiedad y deterioro cognitivo, respectivamente.

Resultados. Se encontró que las mujeres tuvieron puntuaciones BAI significativamente más altas que los hombres (9,0 vs 3,5; p = 0,025), sin diferencias significativas en MoCA por sexo. Las puntuaciones totales de BAI y MoCA mostraron una correlación inversa. Los mayores de 70 años tuvieron mayor probabilidad de puntuaciones alteradas en BAI, y una tendencia no significativa en MoCA (OR: 2,43; p = 0,066). Los hombres mostraron mayores tasas de deterioro cognitivo que las mujeres, aunque sin significación estadística.

Conclusión. Los mayores de 70 años mostraron mayor probabilidad de ansiedad alterada y una tendencia no significativa hacia un mayor deterioro cognitivo. Los resultados subrayan la necesidad de intervenciones específicas para mejorar la salud mental y cognitiva en esta población vulnerable.

Palabras clave

Ansiedad; deterioro cognitivo; persona mayor; psicología; latitud alta.

Introduction

A notable demographic phenomenon has emerged in recent decades: the progressive increase in the elderly population, driven mainly by the lengthening of life expectancy. It is projected that by 2050, approximately one in six people worldwide will be over 65 years of age [1]. This demographic transition entails a significant epidemiological transition, marked by an increase in neurodegenerative diseases, as a natural result of population aging [2]. This context poses a crucial challenge: understanding and addressing the neurocognitive changes expected in old age, particularly cognitive decline [3]. Although this phenomenon is a normal part of the neuronal aging process, it can be exacerbated by various factors, including anxiety and other emotional disturbances [4]. Older people are especially susceptible to these triggers, which can accelerate cognitive decline and, therefore, brain aging [4]. On the other side, extreme southern population has a significantly negative impact of life due to seasonal sensitivity [5,6]. Besides, there is evidence that suggests older people are psychologically affected by seasonal changes [7,8].

Cognitive decline refers to the gradual loss of cognitive functions such as memory, attention, and processing speed, characteristic of normal aging [9]. However, its magnitude and impact can vary considerably between individuals, either due to life circumstances or the environment in which they develop from the sixth decade of the life cycle [10]. This magnitude can be observed mainly in extreme environments [11].

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About anxiety, it has been observed to have a significant impact on cognitive deterioration [12]. Anxiety manifests itself as a persistent and unpleasant response to the perception of a potential threat, giving rise to a series of physiological, affective, cognitive, and behavioral reactions that hinder adaptation [13]. In the specific case of older people, the presence of anxiety may be related to the fear of cognitive deterioration and its possible implications, generating worries and emotional discomfort [14,15].

Furthermore, populations residing at extreme latitudes, such as those in southern Chile, face significant environmental challenges due to seasonal sensitivity. These challenges harm quality of life, and there is evidence suggesting that older adults are psychologically affected by seasonal changes. In particular, seasonality could be related to the incidence of anxiety disorders, especially in countries located at high latitudes [16].

Although the relationship between cognitive decline and anxiety in older people is not yet fully understood, preliminary evidence suggests that patients diagnosed with different types of anxiety disorders exhibited greater brain aging than healthy patients [17]. These factors could be aggravated in the case of older people due to the vulnerability suffered by this age group, which makes it the second most susceptible group to adverse factors [18]. This raises the need for deeper investigations to better understand this relationship and its clinical implications. The present study aims to characterize the levels of anxiety and cognitive impairment in older adults in the city of Punta Arenas, exploring the possible influence of extreme environmental conditions typical of the southern latitude on this relationship. This approach aims to not only improve the understanding of these processes but also identify opportunities for early interventions that can improve quality of life and prevent or delay the development of neurocognitive disorders in this vulnerable population.

Methods

Design

A descriptive pilot design was used due to the novelty of the approach to extreme latitude and the lack of previous studies in this geographic area. This design allows a first approximation to the characterization of the phenomena of interest in a little-studied population. The sampling study was executed using a non-probability method.

Participants

72 elderly residents of Punta Arenas were recruited through mass dissemination on social networks and invitations from different groups of elderly people in the region. The inclusion criteria for the study were that people were at least 60 years old, self-sufficient, and had no levels of diagnosed cognitive impairment. The volunteers were summoned to the offices of the Teaching Assistance and Research Center of the University of Magallanes (CADI-UMAG), where the evaluations were applied.

All participants gave written informed consent and permission before participating. The Ethics Committee of the University of Magallanes (N°10/CEC-UMAG/2023) approved this study, following the standards established by the Declaration of Helsinki on ethical principles in human beings.

Procedure

The elderly were summoned during the morning session and taken to a waiting room to get comfortable before the evaluation. Demographic data, including age and sex, were used to

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perform an anamnesis. Two instruments, the Beck Anxiety Inventory (BAI) and the Montreal Cognitive Assessment (MoCA), were measured in this exact order.

Beck Anxiety Inventory (BAI):

It corresponds to a test developed by Beck and collaborators; the Spanish version was used [19]. This test includes four symptomatic dimensions of anxiety that were evaluated from 21 questions using a Likert-type scale ranging from 0 (absence of symptoms) to 3 (severe symptoms). Considering the last two weeks counting the evaluation day and, after adding the items, a score is obtained that varies between 0 and 63. Their scores are classified into the following categories: 0-7 represented minimum level of anxiety (absence); 8-15, mild anxiety level; 16-25, moderate level of anxiety; 26-63, level of severe anxiety. In its dichotomous interpretation, 0-7: was considered a normal score; greater than 7, altered.

Montreal Cognitive Assessment (MoCA):

It corresponds to a test used to determine the degree of cognitive impairment [20]. The test evaluated 6 domains: memory (5 points), visuospatial ability (4 points), executive function (4 points), attention/concentration/working memory (5 points), language (5 points), and orientation (6 points), in which the score scale fluctuates between 0 and 30, with the highest result related to optimal cognitive functioning. The test was conducted in 10 minutes, and 1 extra point was given to those participants who had more than ≤ 12 years of academic training. In its dichotomous interpretation, the following scores were considered: score greater than 25 presents absence of cognitive impairment; total score of 25 or less shows some degree of cognitive impairment. This study used the version of the test validated in Chile [20].

Statistical analysis

Statistical analysis was performed in STATA 16.0 software (Texas, U.S.A.). The scores obtained in the BAI and MoCA tests were described by statisticians (mean, median, and standard deviation), and age was stratified into 2 groups: 60 to 70 years old and over 70 years old, according to sampling distribution. The test statisticians were described using the demographic variables sex and stratified age. A non-parametric bivariate analysis (U-Mann Withney) was also performed between the total scores of the MoCA and BAI tests according to sex and age. A reliability analysis was also performed using Cronbach's alpha. Then, the total scores of both tests were dichotomized into normal and altered in a contingency table according to tests interpretation. Finally, the correlation of the BAI and MoCA tests with their respective items was determined using Spearman's correlation coefficient. The degree of significance was determined by a p-value at 0.05 and analyzed using the Sidak correction method.

Results

The sample consisted of 72 older adults, aged between 60 and 87 years, residing in the city of Punta Arenas. The median age was 72 years in men and 71 years in women, with no statistically significant differences between the sexes. Regarding the reliability of the tests, the Cronbach's alpha of the BAI corresponded to 0.85, while the MoCA test was 0.72.

A significant difference was observed in the total scores of the Beck Anxiety Inventory (BAI) between men and women. Women presented significantly higher BAI scores than men (median: 9.0 vs. 3.5; p = 0.025), as it can be seen in Table 1. When breaking down the results

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Table 1. Descriptive data of total BAI scores by age categories according to sex.

Age categories (years)	Total BAI score								*p-value
	Female (n=60)				Male (n=12)				
	Mean	p50	SD	range	Mean	p50	SD	Range	
60-70 (n: 30)	8.7	5.0	10.0	0-49	4.0	3.0	2.6	1- 8	0.296
>70 (n: 45)	14.8	13.0	11.3	0-43	7.5	4.0	9.6	0-27	0.068
Total (n: 72)	12.3	9.0	11.1	0-49	6.1	3.5	7.5	0-27	0.025

Note. *p-value obtained by U-mann Whitney test.

by BAI items, significant differences were found in most items, except for the "Autonomic" item. Specifically, women over 70 years of age showed higher levels of anxiety, highlighting the magnitude of anxiety in the neurophysiological, cognitive, and emotional dimensions (Table 2).

Table 2. Descriptive data of total BAI scores by item according to age categories and sex.

		BAI scores									p-value*
		60-70 years (n: 30)			> 70 years (n: 45)			Total (n:72)			
		Mean	p50	IQR	Mean	p50	IQR	Mean	p50	IQR	
Female (n = 60)	Total BAI	8.7	5	10	14.8	13	15	12.3	9	13	0.013
	Neurophysiological	1.7	1	2	3.3	2	4	2.6	1	4	0.049
	Autonomic	2.1	1	3	2.9	2	4	2.6	2	4	0.149
	Cognitive	3.5	2	4	6	5	6	5	4	5	0.006
	Emotional	1.4	1	2	2.7	2	5	2.2	1	3	0.004
Male (n = 12)	Total BAI	4	3	2	7.6	4	12	6.1	4	7	0.94
	Neurophysiological	0.6	0	1	1.6	0	3	1.2	0	2	0.76
	Autonomic	0.6	0	1	1.4	0	2	1.1	0	2	1
	Cognitive	2.4	3	1	3.3	2	8	2.9	3	4	0.93
	Emotional	0.4	0	0	1.3	1	3	0.9	0	2	0.318

Note. *p-value obtained by U–Mann Whitney test.

Regarding cognitive assessment using the Montreal Cognitive Assessment (MoCA), total scores showed no significant differences between men and women (median: 22.5 vs. 24, p = 0.593). In general terms, no statistically significant differences were observed in MoCA scores between men and women (Table 3). However, a trend toward more significant cognitive decline in men was observed without reaching statistical significance. Spearman correlation analyses showed an inverse correlation between BAI and MoCA total scores, suggesting that higher anxiety levels are associated with a decline in cognitive abilities, especially in areas related to auditory perception, processing speed, attention, and working memory.

Table 3. Total MoCA scores according to items by age categories over sex.										
		MoCA scores								p-value
		60-70 years			> 70 years			Total			
		Mean	p50	IQR	Mean	p50	IQR	Mean	p50	IQR	
Female	MoCA Score	22.0	23	10	21.7	22	8	21.8	22.5	8.5	0.593
	Executive functions	3.8	4	1	3.5	4	1	3.6	4	1	0.477
	Identification	2.4	3	1	2.6	3	1	2.5	3	1	0.183
	Attention	3.9	5	4	4.0	4	2	3.9	4	2	0.864
	Language	1.8	2	2	1.6	2	1	1.7	2	2	0.503
	Abstraction	1.6	2	0	1.6	2	1	1.6	2	1	0.888
	Memory	2.6	3	4	2.7	3	3	2.7	3	3	0.922
	Orientation	5.8	6	0	5.9	6	0	5.9	6	0	0.368
Male	MoCA Score	25.2	26	2	22.1	22	8	23.4	24	5.5	0.321
	Executive functions	4.0	4	2	3.4	4	2	3.7	4	1.5	0.535
	Identification	2.8	3	0	2.9	3	0	2.8	3	0	1.000
	Attention	5.0	5	1	3.7	5	3	4.3	5	2.5	0.305
	Language	2.2	2	1	2.0	2	2	2.1	2	1.5	1.000
	Abstraction	2.0	2	0	0.9	1	2	1.3	2	1.5	0.053
	Memory	3.2	3	1	2.9	3	4	3.0	3	1.5	0.891
	Orientation	6.0	6	0	6.0	6	0	6.0	6	0	1.000

In the Spearman correlation, all BAI items presented a high correlation with each other and were statistically significant. Regarding the items of the MoCA test, correlations were found specifically in visual-executive/attention, attention/abstraction, attention/delayed memory, and abstraction/delayed memory. The BAI/MoCA total scores presented an inversely proportional correlation. It was also observed that the correlations between the BAI items/MoCA total score and the MoCA items/BAI total score presented an inversely proportional trend. However, none of the interactions between items were statistically significant (Table 4).

In dichotomous analysis, participants older than 70 years were more likely to have impaired BAI scores (OR: 2.43; p = 0.066), whereas the trend toward impaired MoCA scores was not statistically significant. Although no significant differences were found between sexes, men tended to show higher rates of cognitive decline compared to women (Table 5).

Discussion

The results reveal a series of significant findings that contribute to our understanding of the relationship between cognitive impairment and anxiety in the elderly population studied. It was observed that there were no statistically significant differences in the MoCA test scores between the sexes, suggesting that both men and women showed similar levels of cognitive impairment. However, a significant disparity in BAI scores was highlighted, with women exhibiting higher anxiety indicators than men. This finding could be attributed both to the greater representation of women in the study and to the female predisposition to experience anxiety disorders, influenced by the social role and feminine sensitivity ingrained from an early age [21].

	Total BAI score	Neurophysiological	Autonomic	Cognitive	Emotional	Total MoCA score	Executive functions	Identification	Attention	Language	Abstraction	Memory	Orientation
Total BAI score	1												
Neurophysiological	0.8189*	1											
Autonomic	0.8460*	0.6321*	1										
Cognitive	0.9075*	0.6881*	0.6670*	1									
Emotional	0.7683*	0.6063*	0.6329*	0.5646*	1								
Total MoCA score	-0.1651	-0.0297	-0.0696	-0.1837	-0.0952	1							
Executive functions	-0.0256	-0.0955	0.0061	-0.0171	-0.0465	0.5775*	1						
Identification	-0.0244	-0.0476	0.1166	-0.0158	-0.1238	0.2820*	0.2378*	1					
Attention	-0.0739	-0.0699	0.0492	-0.1095	-0.0416	0.7092*	0.4858*	0.1842	1				
Language	-0.2044	-0.0733	-0.1155	-0.1654	-0.1738	0.4604*	0.2182	0.093	0.3527*	1			
Abstraction	-0.0868	-0.0343	0.0191	-0.147	-0.1307	0.4647*	0.3450*	0.1059	0.4027*	0.1887	1		
Memory	-0.0499	-0.0945	-0.0667	-0.0492	0.0161	0.6965*	0.3405*	0.2015	0.5084*	0.183	0.4086*	1	
Orientation	-0.1033	-0.0907	-0.1329	-0.0514	0.0684	0.3265*	-0.0044	0.1323	0.1583	0.2873*	0.0839	0.1972	1

Table 4. Spearman correlation index between total scores BAI and MoCA by items.

Note. *In bold: $p\text{-}value$ <0,05.

Table 5. BAI and MoCA scores crosstabs over sex by age categories.							
			Age categories (years)			OR (IC 95%)	p-value
			60-70	>70	Total		
BAI	*Female*	Normal (0-7)	17	15	32	2.44 [0.75 - 7.98]	0.094
		Abnormal (>7)	8	20	28		
		Total	25	35	60		
	Male	Normal (0-7)	5	5	10	3.00 [0.13 – 196.1]	0.407
		Abnormal (>7)	0	2	2		
		Total	5	7	12		
	Total	Normal (0-7)	22	20	42	2.43 [0.84 - 7.13]	0.066
		Abnormal (>7)	8	22	30		
		Total	30	42	72		
MoCA	*Female*	No cognitive impariment (>25)	9	9	18	1.63 [0.45 - 5.72]	0.391
		With cognitive impairment (0-25)	16	26	42		
		Total	25	35	60		
	Male	No cognitive impairment (>25)	3	2	5	3.75 [0.20 - 75.65]	0.276
		With cognitive impairment (0-25)	2	5	7		
		Total	5	7	12		
	Total	No cognitive impairment (>25)	12	11	23	1.87 [0.61 - 5.77]	0.215
		With cognitive impairment (0-25)	18	31	49		
		Total	30	42	72		

In addition, it was observed that women over 70 years of age were more likely to present anxiety symptoms than participants of younger ages. This phenomenon could be a consequence of the aging process and the subsequent organic deterioration, which increases with age and causes greater emotional changes associated with old age [22]. These results can be explained by the morphofunctional decrease of neurocognitive structures, which will increase over time, accentuating functional deficiencies and leading to greater instances of worry and anguish in the face of the changes that occur in old age [23].

Correlational analysis revealed an inverse association between BAI and MoCA total scores, especially in the language subtest of the MoCA. These results indicate that anxiety symptoms can subtly affect cognitive ability, especially in areas related to auditory perception, processing speed, attention, and working memory. This segment delimits the verbal recovery capacity of the subjects based on the search for a particular phonemic. The decrease in neuronal transmission due to the deterioration of neuroanatomical structures causes a slowdown in information processing, which negatively impacts the performance of participants [23]. Furthermore, the decline in cognitive processes can increase in the presence of anxiety symptoms in a perceptual distortion that characterizes these conditions, redefining the significance of events and attributing them a negative significance that obstructs the adequate performance of the processes, which increases the cognitive dysfunction present in old age, accentuating the cognitive deterioration typical of aging [24].

The results of this study suggest that the persistent biological reactivity associated with anxiety could contribute to brain aging, which would explain why older people with higher

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MoCA scores also presented more pronounced anxiety symptoms. There is evidence that indicates that participants diagnosed with different types of anxiety disorder exhibited greater brain aging compared to patients belonging to the control group. Based on this, persistent biological reactivity was considered as a possible cause of anxious symptoms [17]. This psychological distortion can cause repeated states of bodily agitation due to hypervigilance and hypersensitivity towards the environment, which will deregulate the hormonal axes that makeup stress, indirectly promoting the acceleration of cellular aging [25]. The latter could be an explanation of why participants who obtained lower scores in the MoCA test showed higher scores in the cognitive sphere of anxious symptoms.

Parallelly, anxiety disorders incidence could increase during cold months in Finland, demonstrating that seasonality could be related to anxiety events incidence in a high latitude country [16]

Besides, difficulty differentiating the physiological symptoms of anxiety from common medical conditions in this population may intensify the perception of cognitive and emotional symptoms [26].

In summary, these findings highlight the complex interaction between anxiety and cognitive impairment in older people, highlighting the importance of addressing both psychological and biological aspects in the evaluation and treatment of these disorders in this vulnerable population.

Limitations

The present study is descriptive, so the causal effect of the events in this work cannot be determined. The existing heterogeneity between the sexes in the population must also be considered. However, the results presented allow us to generate data necessary to promote a new study that includes prospective methodologies oriented to cause-effect relationships.

Conclusion

Women had significantly higher BAI scores than men, while there were no significant differences in MoCA scores by sex. Significant interest correlations were found in BAI and some in MoCA, with an inverse correlation between BAI and MoCA total scores. Those over 70 years of age have a greater likelihood of altered BAI scores and a non-significant trend toward altered MoCA results, with men showing higher rates of cognitive decline. This study provides an important foundation for future research by showing that extreme environmental conditions at the southern latitude in Chile may be associated with a higher prevalence of anxiety and its influence on cognitive decline in older adults. These results underline the need to develop intervention strategies tailored to the particularities of this population.

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