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Research Article

Social Factors and Cognitive Functioning in a Puerto Rican Older Adults Sample

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ABSTRACT

Objective: This study aims to examine the moderating role of marital status and religion on cognitive functioning in Puerto Rican older adults.

Methods: Secondary data analysis was conducted (*N*=143), and most of the participants were women (*n*=104, Mage=73). Mini-Mental State Examination (MMSE) raw scores were used to measure cognitive functioning.

Results: Marital status and religion did not moderate the relationship between cardiovascular disease and cognitive functioning (b=2.32, p=0.07, 95% CI [-.20-4.83]), (b=-.35, p=0.86, 95% CI [-4.22-3.52]), respectively. Cardiovascular disease and religion were not related to cognitive functioning; however, marital status was statistically significant related with cognitive functioning (b=2.41, p<0.05, 95% CI [1.16-3.67]), with a median effect size, $\eta 2$=0.08.

Discussion and Conclusion: This study reiterates the importance of integrating social factors, such as having a partner, to reduce the risk of cognitive impairment in old age.

Keywords: Cognitive functioning; Older adults; Marital status; Religion; Puerto Rico

INTRODUCTION

The continuous increase in life expectancy represents one of the great challenges of contemporary society. It is estimated that 1.5 million people over the age of 65 are expected by 2050 [1]. This gives rise to social and economic burden worldwide. Particularly, pathological health conditions represent a social and economic impact on society. Although the prevalence of disability in American seniors has decreased to 20%, the risk of disability increases with age [2]. Disability not only increases expenses on health services; but also reduces the quality of life. In older adults, dementia is one of the leading causes of disability worldwide [1].

Dementia is described as a syndrome that occurs as a result of brain disease, which is generally chronic or progressive (WHO, 1992) [3]. It consists of the impairment of several higher cortical functions, including memory, thought, understanding, calculation, learning, language, and judgment [3]. These deficiencies often occur in conjunction with changes in emotional control, social behavior, or motivation [3].

Although dementia is not part of normal development in old age, it usually occurs late in life [4]. The causes of dementia can vary, depending on the types of brain changes that may be taking place. Furthermore, dementia of the Alzheimer type or Alzheimer's Disease (AD) is the most common type of dementia in old age. Nevertheless, there are other types of dementia: vascular dementia, Lewy-Body dementia, frontotemporal disorder, and mixed dementias [4].

Alzheimer's disease

AD is a progressive and irreversible brain disorder that slowly destroys memory and thinking skills and, finally, the ability to carry out the simplest tasks [5]. AD is thought to begin 20 years or more before the onset of overt symptoms, with small changes in the brain that are imperceptible to the affected person [6]. Only after years of brain changes do people experience noticeable symptoms, such as memory loss and language problems [6]. Symptoms occur because neurons in parts of the brain involved in thinking, learning, and memory (cognitive function) have been damaged or destroyed by obstruction of amyloid plaques and Tau proteins [6]. AD is ultimately fatal, as the cause is not fully understood and, at present, no cure has been found. Medications to treat this disease are not fully effective; they could only delay the evolution of the disease.

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Risk factors: Alzheimer's disease

Age is the main risk factor for the development of AD [7]. Similarly, the older you become, the higher the risk. However, there are other modifiable risk factors, such as cardiovascular health and lifestyle, which have been extensively studied [8-11]. Particularly, cardiovascular diseases, especially in middle adulthood (40-65 years old), are a risk factor for dementia [8-15].

Hypothesis 1: Cardiovascular diseases will be negatively related to cognitive functioning, measured from MMSE raw scores, at a statistical significance level of $p<0.05$.

Protective factors: Alzheimer's disease

Some studies have demonstrated that physical activity and a healthy diet are among the main protective factors for dementia [6,12]. Specifically, a diet based on fruits, vegetables, whole grains, fish, chicken, nuts, and legumes, while limiting fats, red meat, and sugar intake [6]. Other factors such as hormone replacement therapy, cognitive stimulation, and perceived physical health could have a protective effect [8].

Regarding social factors, such as marital status and religion, studies have demonstrated that might affect cognitive functioning [16-27]. Studies have shown that marital status, particularly being married or having a partner, can improve cognitive functioning [17-27].

While several studies have shown that social relationships, particularly being married or having a partner, reduce the risk of cognitive decline, there has also been relevant to assess marital quality dimensions related to cognitive functioning. Several studies have shown that marital relationships that lead to negative emotions (i.e., conflicts, tensions) may increase the risk of cognitive impairment, compared to marital relationships that lead to positive emotions (i.e., emotional support, love) that may lead to better cognitive functioning [28-32].

Hypothesis 2: Marital status (e.g., being married) will be positively related to cognitive functioning at a statistical significance level of $p<0.05$.

Religion has shown that influences both physical and mental health [25]. Several studies have shown that religion has improved the quality of life and well-being in older adults, and plays a protective role in this population [16-25]. Furthermore, Agli and collaborators found that religion seems to slow cognitive decline [16]. These findings offer a pathway forward to address religious beliefs in order to improve the quality of life, particularly, cognitive functioning in older adults.

Hypothesis 3: Self-reported religion will be positively related to cognitive functioning at a statistical significance level of $p<0.05$.

Despite social factors, such as marital status and religion, have demonstrated to understand the cognitive functioning in older adults, biological factors have a tendency to explain Alzheimer's disease [8-11]. Even social factors have been studied to understand cognitive functioning, yet there remains very little research to understand this phenomenon in Puerto Rican older adults. This research gap is addressed in the current research. Therefore, the purpose of the present study is to examine the moderating role of marital status and religion on the cognitive functioning of Puerto Rican older adults.

Hypothesis 4: Marital status and religion will moderate the relationship between cardiovascular disease and cognitive functioning.

MATERIALS AND METHODS

A secondary data analysis study was carried out to examine the moderating role of marital status and religion in the relationship between cardiovascular disease and cognitive functioning. Original data was collected by Drs. Rodriguez-Gomez (PI), Gonzalez-Viruet, Roman-Marrero, and Rodriguez-Benitez from the research titled "Alzheimer dementia screening in Puerto Rican elderly sample" [25]. Convenience sampling method was applied in the original study where all the participants who were living in senior housing and were American Association Retired Persons (AARP) members from the following Puerto Rico towns: San Juan, Bayamon, Guayama, Mayaguez, Fajardo, Vieques, and Castaner were included and those who were not willing to take part in the study were excluded. The informed consent form was signed by the interviewee after being informed about the study purpose by the researcher. The formal permission was obtained from the senior housing authority for conducting the study. Demographic data and neuropsychological assessment battery were used as the original study instruments. Neuropsychological assessment battery included the following tests: digit span and similarities tests from WAIS-III (Spanish version: EIWA-III), Animal Naming Test, Wechsler Memory Scale, Clock Drawing Test, and Mini-Mental State Examination (MMSE).

Permission was obtained from the PI, Dr. Rodriguez-Gomez, before proceeding to use the database from the original study [25]. In an effort to protect the confidentiality research participants, a control number was given on the database. The data included in the analyses were demographic variables (i.e., sex, age, education years, marital status, and religion), self-reported cardiovascular disease data, and MMSE raw scores.

Data were as analyzed using computer-based statistical software, SPSS-X version 23. Results were analyzed by moderation analysis using the PROCESS program. A 'p' value of <0.05 was considered statistically significant. After compilation, the data were presented in the form of tables. The study was reviewed and approved for exemption by an Institutional Review Board.

RESULTS

Socio-demographic profile

The total sample consisted of 143 participants (104 females, 39 males). The majority of the respondents (n=63, 44.1%) are from the age group 61-71 years. The median age of the respondents was 73 ± 8.1 years. Among 143 participants, 42 of them reported 12 years of study. The majority of the participants do not were in relationships (n=93, 65%), and practiced a religion (n=124, 86.7%). A little more than half of the participants reported that have cardiovascular disease (n=72, 50.3%) (Table 1).

MMSE raw scores range from 10 to 30, and the median score was 24.8 (SD=4.1). The majority of the participants (n=20, 14%) obtained a 28 score (Table 2).

Moderation analysis

To test the interaction effect between moderator variables (marital status and religion) on cardiovascular disease and cognitive

Table 1: Socio-demographic characteristics of the participants.

Characteristics	n	%
Sex		
Female	104	72.7
Male	39	27.3
Age groups		
61-71 years	63	44.1
72-82 years	61	42.7
83-94 years	19	13.3
Marital status		
Married/romantic relationship	50	35
Divorced/widowed/single	93	65
Religion		
Catholic/Protestant	124	86.7
None	19	13.3
Cardiovascular disease[a]	72	50.3
Years of study[b]	42	29.4

Note: N=143. M_{age}=73-years (SD=8.1).
[a]Reflect the number and percentage of the participants that answered "yes" to this question.
[b]Reflect the number and percentage of the participants that answered that have 12-years of study (M=12.2, SD=4.7).

Table 2: MMSE raw scores frequencies.

Raw scores	f	%
10	1	0.7
11	1	0.7
13	1	0.7
14	1	0.7
16	1	0.7
17	2	1.4
18	2	1.4
19	10	7.0
20	6	4.2
21	5	3.5
22	3	2.1
23	10	7.0
24	9	6.3
25	16	11.2
26	16	11.2
27	12	8.4
28	20	14.0
29	19	13.3
30	8	5.6

Note: The median raw scores of the participants was 24.8 (SD=4.1).

functioning, moderation analysis was conducted. In order to test this analysis, it was transformed to dummy (0=absent, 1=present) marital, religion, and cardiovascular disease variables. Marital status was coded as 1 for those who were in a romantic relationship (married/relationship relationship), whereas those who were not in a romantic relationship were coded as 0. Religion was coded as 1 for those who practiced a religion (Catholic/Protestant), whereas those who were not practicing a religion were coded as 0. Cardiovascular disease was coded as 1 for those who answered "yes" to this question, whereas those who answered "no" were coded as 0. MMSE raw scores were maintained as a continue variable.

First, it was explored the relationship between cardiovascular disease and cognitive functioning, and the interaction effect between cardiovascular disease and marital status. It was found that cardiovascular disease was unrelated to cognitive functioning (b=-.35, p=.60, 95% CI [-1.68-.97]). However, it was found that marital status was related to cognitive functioning (b=2.41, p<0.05, 95% CI [1.16-3.67]), with a medium effect size, η^2=0.08. The interaction effect did not reach statistical significance; thus, marital status did not moderate the relationship between cardiovascular disease and cognitive functioning (b=2.32, p=0.07, 95% CI [-.20-4.83]). Results showed that the interaction effect did not increase the relationship between having cardiovascular disease and cognitive functioning changes (Table 3).

Second, it was explored the relationship between cardiovascular disease and cognitive functioning, and the interaction effect between cardiovascular disease and religion. It was found that cardiovascular disease was not related to cognitive functioning (b=-.45, p=.52, 95% CI [-1.82-.92]), nor religion (b=-.27, p=.78, 95% CI [-2.21-1.66]). The interaction effect did not reach statistical significance; thus, religion did not moderate the relationship between cardiovascular disease and cognitive functioning (b=-.35, p=.86, 95% CI [-4.22-3.52]). Results showed that the interaction effect did not increase the relationship between having cardiovascular disease and cognitive functioning changes (Table 3).

Chi-square tests

In order to examine whether there were differences between age and sex groups regarding cardiovascular disease, two chi-square tests were conducted. The first analysis was intended to examine whether the age of the participants was related to cardiovascular disease.

In the first analysis, it was found that the age of the participants was not significantly related to cardiovascular disease, χ^2 (2)=0.08, p>0.05 (Table 4). Both participants aged 61-71 years, as well as those aged 72-82 and 83-94 years have the same risk of cardiovascular disease.

The second analysis was intended to examine whether the sex of the participants was related to cardiovascular disease. In the second analysis, it was found that the sex of the participants was also not significantly related to cardiovascular disease, χ^2 (1)=0.02, p>0.05 (Table 5). Both male and female participants have the same risk of cardiovascular disease.

DISCUSSION

Studies aimed to evaluate AD risk factors usually are focused on biological, instead of social factors, such as marital status and religion [8-11]. Nevertheless, the present study examined the moderator role of marital status and religion on cognitive functioning of Puerto Rican older adults.

Results of this study were inconsistent with Hypothesis 1, cardiovascular disease was unrelated to cognitive functioning, whereas the majority of the research states the opposing view [8-15]. Furthermore, it was examined if there were differences between age and sex groups on cardiovascular disease. The results revealed that any age group as any sex has the same risk to develop cardiovascular disease. This introduces novelty to previous literature since it is stated that, the older you become, the higher the risk of developing

Table 3: Moderation analysis.

Variables	Unstandardized coefficients		95% CI	
Models	**b (Typical error)**	**t**	**LL**	**UL**
	Model 1			
MS	2.41 (.64)	3.79*	1.16	3.67
CVD	-.35 (.67)	-.53	-1.68	.97
MS × CVD	2.32 (1.27)	1.82	-.20	4.83
	Model 2			
Religion	-.27 (.98)	-.28	-2.21	1.66
CVD	-.45 (.69)	-.65	-1.82	.92
Religion × CVD	-.35 (1.96)	-.18	-4.22	3.52

Note: CI=Confidence Intervals; LL=Lower Limit; UL=Upper Limit; CVD=Cardiovascular Disease; MS=Marital Status; MS × CVD=interaction effect between MS and CVD variables; Religion × CVD=interaction effect between Religion and CVD variables. *p<.05.

Table 4: Age groups and cardiovascular disease cross-tabulation.

Variables	Age Groups				
Cardiovascular Disease	**61-71**	**72-82**	**83-94**	**χ^2**	**Cramer's V**
No	32	30	9	0.08	0.02
	(0.2)	(-0.1)	(-0.2)		
Yes	31	31	10		
	(-0.2)	(0.1)	(0.2)		

Note: Adjusted standardized residuals appear in parentheses below group frequencies.

Table 5: Sex and cardiovascular disease cross-tabulation.

Variables	Sex			
Cardiovascular Disease	**Male**	**Female**	**χ^2**	**Φ**
No	19	52	0.02	-0.01
	(-.1)	(1)		
Yes	20	52		
	(1)	(-1)		

Note: Adjusted standardized residuals appear in parentheses below group frequencies.

diseases, including cardiovascular disease, and that women are at more risk of developing them [33-36].

The present study, also, offers the researcher insight into considering other factors, such as years of study, to evaluate cognitive functioning. Hence, this research expands previous studies that stated that education level affects cognitive functioning [37,38]. As previously noted, the median from MMSE raw scores (M=24.8) suggested that most of the participants have no cognitive impairment. These scores are influenced by the participants' education. As studies suggested, education level has demonstrated to affect MMSE scores more than age [39]. Moreover, this study found that the majority of the participants have 12-years of study (SD=4.7). Contrary to typical education level in this age group in Puerto Rico, this result suggests that most of the respondents have a high education level. Studies have shown that 60-years and older population have not graduated from high school in Puerto Rico (53.8%) [40]. Therefore, education could have protected most of the participants, even those who have cardiovascular disease, to get high MMSE scores (>24), and reduce the risk for cognitive impairment.

Consistent with Hypothesis 2, marital status (e.g., being married) it is related to cognitive functioning. This result supports the notion that having a partner, either being married or in a romantic relationship, improves cognitive functioning [17-27]. Although this study did not assess marital quality, studies have shown that marital quality could influence cognitive functioning [32]. For example, marital relationships that lead to stress could impair cognitive functioning, compared to those relationships that give rise to positive emotions, such as emotional support, could lower risk on cognitive impairment [3,41].

Results were inconsistent with Hypothesis 3; religion was unrelated to cognitive functioning. Contrary to previous studies findings, this study suggests that both those who practice a religion (Catholic, Protestant), and those who do not practice a religion have the same risk for changes in cognitive functioning [16,24]. These findings could be due to differences in religious practices (e.g., attending religious services, faith magnitude, and frequency of prayers), and involvement frequency in those practices [42]. Also, the time attending religious practices could be related to cognitive functioning in the elderly [43].

Inconsistent with Hypothesis 4, neither marital status nor religion moderated the relationship between cardiovascular disease and cognitive functioning. This finding suggests that none of the variables changes the magnitude of the relationship between cardiovascular disease and cognitive functioning. This was expected after results revealed that cardiovascular disease is unrelated to cognitive functioning. These findings contribute something new to the existing literature demonstrating that marital status and religion do not protect those with cardiovascular disease against cognitive impairment.

LIMITATIONS OF THE STUDY

This research has some limitations. The study sample size was small. The original study used self-reports, which are prone to bias [44]. Also, the original study was done with AARP members, which may reflect socioeconomic conditions above the average of Puerto Rican older adults. We were unable to examine the age at which participants were diagnosed with cardiovascular disease, as the original data only indicated the presence or absence of the disease among participants. Studies have shown that been diagnosed with cardiovascular disease, particularly in middle adulthood (40-65 years old), is a risk factor for dementia [8-15]. Therefore, it was not examined due to the study design, in which secondary data analysis is based on variables in the database. For example, depression measure is not available in the database, and depression has shown as a risk factor for AD development [45-49].

CONCLUSION

This investigation was able to expand the social factors literature concerning cognitive functioning in older adults. The findings of this study, surprisingly showed, that older adults with cardiovascular disease compared to those without them, introducing the idea that the presence of cardiovascular disease may not represent a precursor to cognitive functioning changes. Most of the participants indicated high education level, thus education could have protected them from changes in cognitive functioning, such as cognitive impairment. Marital status (e.g., being married) was the only social factor variable related to cognitive functioning. This finding suggests that having a partner, but not a religion (Catholic, Protestant) reduces the risk for cognitive impairment. Moreover, most participants that are in a relationship may likely have positive emotions with their partner, such as love, which can lead to better cognitive functioning as shown in MMSE raw scores.

Although the conclusions of this study should be considered preliminary until replicated and expanded, the evidence from this study provides researchers with a more nuanced understanding of integrating social factors, such as having a partner, to reduce the risk for cognitive impairment in old age. This finding expands the literature on the protective effect against dementia that social contact has in old age. This suggests that cognitive stimulation activities, such as social nature activities, may increase cognitive reserve.

RECOMMENDATIONS

Future research should replicate this study by using a larger and heterogeneous sample of older adults. It is also recommended to assess the marital relationship quality from both members of the couple and, even better, measure marital quality over time. Examine the marital relationship quality affords a nuanced understanding of the factors underlying the relationship that might be involved in cognitive functioning. Religious practices and level of religiosity should be examined, as well. Researcher's inclusion of multiple independent variables, such as years of study, should be recommended. Future study should explore other measures to assess cognitive functioning which are not potential cultural bias or differences in education level, such as MMSE. The findings from this investigation not only expound the literature but also provide a framework for future investigations examining social factors in the relationship between cardiovascular disease and cognitive functioning.

DECLARATION OF CONFLICTING INTERESTS

The authors declared that there is no conflict of interest.

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