Determinants of Cognitive Health Among Aging Adults in Agincourt, South Africa

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Abstract

This study examines influences on cognitive health, showing how aging increases the odds of cognitive impairment by focusing on orientation to time and person among aging adults in Agincourt, South Africa. The Health and Aging in Africa: A Longitudinal Study of an INDEPTH Community in SA (HAALSI) Cohort from the Agincourt data set was used. Binary logistic regression analysis examined factors associated with cognition. Ability to read and/or write positively correlated with the correct recall of year, month, and date. Marital status, HIV status, and hypertension negatively correlated with the correct recall of year, month, and date. Correct recall of a person is influenced by age, duration of residence, ability to read/write, marital status, and hypertension. This study adds to the nascent research on cognitive impairment in Africa. The findings support earlier research on factors that correlate with cognitive impairment. To achieve healthy aging, factors such as hypertension and HIV must be controlled not only among aging adults but people of all ages.

**Key Words**: cognitive dysfunction, South Africa, healthy aging, high blood pressure, HIV infections.

Introduction

In current decades, there has been an expanded interest in the outcomes of cognitive decline among older populations (Langa et al., 2018). “Cognition, the potential to understand and become aware of one’s surroundings, including perceiving, conceiving, remembering, reasoning, judging, imagining, and problem-solving, declines with aging” (Shukla, 2021). The article (Baltes, P. B., Lindenberger, U., 1997) states that maintaining a strong cognitive ability is critical for functional independence as one ages. Dementia, an outcome of cognitive degeneration, is on the rise in low and middle-income countries due to significant increases in aging populations (Chan, Adeloye, Asante, et al., 2019; Kalaria, Maestre, Arizaga, et al., 2008). This study examined factors associated with cognitive health among aging people in Agincourt, South Africa.
Different measures have been used to assess cognition, such as language tasks (picture naming, semantics), memory tasks (orientation, word encoding), self-reports, informant reports, and performance-based measures. While self-report and informant report measures are believed to be problematic, performance-based assessment whereby well-defined functional tasks are rated by direct observation of trained raters tend to be most valid and reliable (Giovannetti et al., 2006).

This study focuses on the factors that significantly impact cognitive health-orientation to time and person and examines the determinants of cognitive functioning among aging adults in Agincourt, South Africa. The following research question guided the study: What factors significantly impact cognitive health - orientation to time and person - in South Africa? Cognitive impairment is measured by memory tasks, focusing on four different orientation measures. Orientation refers to the timing between a person and the “internal representation he/she forms of the corresponding public reference system, i.e., the external world” (Berrios, 1982). In fact, orientation to time, place, and person is an important aspect of cognitive functioning (Dodd & Bucci, 1987: 53). It processes how the self can relate to time (events), person (people), and places (Peer, Salomon, Goldberg, Blanke & Argy, 2015). Cognitive impairment measures used in this study are memory task-focused. These are: a. Orientation to the year (study participants were asked to state the current year). b. Orientation to the month (study participants were asked to state the month). c. Orientation to the date (study participants were asked to state the date). Lastly, d. orientation to the president, where study participants were asked to state the current president.

**Literature Review**

Our attention to the world around us, recollections of past activities, expertise in language, judgments on how the world works, and abilities to resolve issues all contribute to how we behave and engage with our surrounding environment. Cognition is vital for people as they age to live independently and manage activities of daily living (Murman et al., 2015). There are numerous age-related types of changes in cognition that are a part of the normal aging process. “The population of aging adults may experience declines in performance and cognitive tasks that are crucial for processing and remembering information” (Murman et al., 2015). Salthouse (2004) also observed a positive relationship between vocabulary,
knowledge, and age. While age is a significant determinant of cognition, other factors are strongly associated with cognitive health.

Education has been found to be an important factor (Navarro et al., 2015). "The ability to read and write, think, learn, and remember is an important component of cognition" (Swanson et al., 2003). Barnes et al. (2003) found that aged men and women with better literacy scores completed higher on all measures of cognition and that reading and writing significantly influence cognitive decline in older adults. “Studying and writing should lead directly to the enrichment of neural networks, that can permit humans with higher ranges of literacy to have larger cognitive reserves to process cognitive information more efficiently” (Stern et al., 2002).

Gender is also a significant factor. Studies show that men and women have unique risk elements for age-associated cognitive impairment. “Men may be at a higher risk of experiencing mild cognitive impairment (MCI), the stage of mild memory loss that occurs between everyday aging and dementia, than women” (Mayo Clinic, 2012). Cross-sectional research suggests gender differences in cognitive function and risk of Alzheimer’s disease in aging adults. Results in other studies propose that “styles of cognitive decline and occurrence of AD are similar in older males and females” (Barnes et al., 2003).

Marital status is another vast determinant. Being in a relationship with a partner would possibly suggest cognitive and socially demanding situations that have a protecting effect in opposition to cognitive impairment later in life (Hakansson et al., 2009). Chen (2018) tested the affiliation between marital quality and change in cognitive limitations experienced later in life. Results indicate that “better marital experiences are related to a slower increase in cognitive limitations, and the affiliation between negative marital experiences and cognitive barriers is comparable for men and women” (Chen, 2018). This looks at possible motives for the impact of negative marital experiences on the cognitive health of older adults over the years, irrespective of gender.

Duration of residence in different countries has been found to be significant with cognitive decline in older aging adults (Diemer & Blustein, 2007). Residential status and length have been related to numerous determinants of health and
wellbeing. Zang et al. (2017) assessed the changes in cognition among older adults with residential statuses (urban residents, rural-to-urban residents, rural citizens, and urban-to-rural citizens) over a 12-year duration. This study suggests that residential status influences the changes in cognition associated with aging adults. More studies look specifically at older adults with grandchildren residing with them as a cognitive determinant to understand general changes in household composition. (Zimmer, 2005) states that “The number of older adults living with orphaned grandchildren has changed over time since it is suspected that the burden of care for grandchildren is increasing rapidly as a result of the AIDS epidemic in south Africa.” This shows how older adults taking on this role to care for grandchildren could be affecting the cognitive decline in less developed countries.

Depression has been proven as a predictor of cognitive decline. Symptoms of depression later in life is a significant health care risk for older adults and a major motive of disability (Fiske, 2009). Despair in older humans may additionally inhibit someone from maintaining activities of daily living. Late-life depression may be associated with deficits in cognitive characteristics, which may vary depending on the duration of the illness (Fiske, 2009). “Cognitive dysfunction in depressed older adults may additionally consist of memory impairment, poor attention, and executive dysfunction” (Fiske, 2009). Many studies assessed the effect of a child’s death on cognitive decline in late life, hypothesizing that such adversity could be associated with chronic psychological stress and result in faster cognitive decline (Greene, 2014).

The relationship between blood pressure, cognitive function, and dementia has acquired tons of interest from studies in recent years (Qiu et al., 2005). Cross-sectional research has proven an inverse association between blood pressure and the prevalence of dementia (Reitz et al., 2007). Observational research and scientific trials provide limited evidence for the protecting effect of antihypertensive therapy in opposition to dementia and stroke-associated cognitive decline (McGrath et al., 2017). Atherosclerosis, on account of long-standing hypertension, can be a fundamental biological pathway linking both high blood pressure to cognitive decline and dementia (Jung et al., 2013).

Another health condition associated with cognitive impairment is HIV (Watkins et al., 2015). HIV can result in a severe illness referred to as AIDS (Hardy et al.,
2009). When someone has AIDS, they are more likely to get infections and more vulnerable to cancers and other critical illnesses (Hardy et al., 2009). "In 2016, almost half of the population in America based on areas residing with identified HIV were age 50 and older" (CDC, 2022). The virus can travel to the brain, where it can move the blood brain barrier by way of infecting vascular epithelial cells, allowing it access to the brain, and affecting the daily living of a person (Kamkwalala et al., 2017). Cognitive functioning in aging adults may be influenced by HIV-related ongoing neurodegenerative effects in older adults, “especially if the man or woman is infected late in life and is undiagnosed or untreated for some time after exposure, or if they have lived with the disease for almost their entire life” (Kamkwalala et al., 2017). Specifically, in South Africa, the impact of the HIV epidemic in older people is formed by the social, political, demographic, and economic situations in which they live (Hosegood, 2006). A study in rural KwaZulu-Natal in 2000 found that “two percent of people dying of AIDS with or without tuberculosis were age 60 or more, representing five percent of all deaths in this age group” (Hosegood, 2004).

**Setting**

The Agincourt population is in the "sub-district of Bushbuckridge district, Mpumalanga Province, within the rural north-east of South Africa, near the eastern border with Mozambique" (Kahn et al., 2007). Almost a third of the study population is of Mozambican origin. Many entered the United States as refugees within the early to mid-eighties during and after the civil conflict. They constituted a large population of self-settled refugees under health and demographic surveillance (Kahn et al., 2007). The population is about 70,000 people in 21 villages and 11,700 households. Most of the population is low-income, and many of the populations with higher burdens of tuberculosis and HIV mortality suffer from poverty. There are a growing number of schools, but most of the older population have little to no education. Agriculture is a completely vital region in South Africa regarding job opportunities in rural regions; however, it also contributes largely to foreign exchange. Agriculture in South Africa is so numerous and wealthy regarding vegetation types, biodiversity, climates, and distinct varieties of soil (Scherr et al., 2008).
Methods

Data in this study came from the Health and Aging in Africa: A Longitudinal Study of an INDEPTH Community in SA (HAALSI) Cohort from Agincourt. This is baseline data collected between 2014 and 2015. A binary logistic regression analysis was used to examine factors associated with cognition. Four measures of cognitive health that focus on orientation were used: a. Orientation to the year; b. Orientation to the month; c. Orientation to the date; and d. Orientation to the president. Participants were asked to name the current year, month, date, and president. The answer choices were: 1. Correct; 2: Incorrect, and 3. Don’t Know. Answers were recorded into 2 categories: correct and incorrect, by adding the don't know cases to the incorrect category. The dependent and independent variables are shown in Table 1. The dependent variables are the duration of residence in Agincourt, age, depression, number of deceased children, number of grandchildren residing with respondents, HIV serostatus, sex, marital status, blood pressure status, and education.

Results

The sample consisted of participants that were mostly female (53.60%) and married (50.90%). The average age of respondents was 62 years. They had lost on average 1.36 children and had lived in Agincourt for an average of 36 years. Respondents had a little over two grandchildren living with them at the time of the survey and had mostly no formal education (45.70%). While 12.40% were HIV positive, about 42% had ever been told to have high blood pressure.
|                      | N   | Mean | %  | SD  |
|----------------------|-----|------|----|-----|
| **Dependent Variables** |     |      |    |     |
| Orientation to time – YEAR |     |      |    |     |
| Correct answer       | 3701| 76.50|    |     |
| Incorrect answer     | 1139| 23.50|    |     |
| Orientation to time – MONTH |     |      |    |     |
| Correct answer       | 4035| 82.60|    |     |
| Incorrect answer     | 850 | 17.40|    |     |
| Orientation to time – DATE |     |      |    |     |
| Correct answer       | 3545| 73.30|    |     |
| Incorrect answer     | 1294| 26.70|    |     |
| Orientation to person – PRESIDENT |     |      |    |     |
| Correct answer       | 4063| 83.30|    |     |
| Incorrect answer     | 1139| 16.70|    |     |
| **Independent Variables** |     |      |    |     |
| Duration of residence in Agincourt | 3265 | 36.20 | 14.86 |     |
| Age                  | 5017 | 62.43 | 13.02 |     |
| Depression score     | 4936 | 1.71  | 1.42  |     |
| Number of deceased children | 4728 | 1.36  | 1.74  |     |
| Number of grandchildren residing with respondent | 4054 | 2.18  | 2.20  |     |
| Tested positive for HIV |     |      |    |     |
| Yes                  | 623  | 12.40 |     |     |
| No                   | 4402 | 87.60 |     |     |
| Sex                  |     |      |    |     |
| Male                 | 2345 | 46.40 |     |     |
| Female               | 2714 | 53.60 |     |     |
| Marital status       |     |      |    |     |
| Married              | 2575 | 50.90 |     |     |
| Not married          | 2482 | 49.10 |     |     |
| Ever been told to have high BP |     |      |    |     |
| Yes                  | 2118 | 41.90 |     |     |
| No                   | 2937 | 58.10 |     |     |
| Education            |     |      |    |     |
| No formal education  | 2306 | 45.70 |     |     |
| Some primary (1-7 years) | 1612 | 32.00 |     |     |
As shown in Table 2, several factors are significantly associated with orientation to person. Male respondents were almost three times (2.887) more likely to correctly name the president compared to their female counterparts. Married respondents and people who had been told to have high blood pressure were, respectively, 1.6 and 1.7 times more likely to correctly name the president compared to unmarried and people who have never been told to have high blood pressure. Compared with people with at least a secondary school education, respondents with no formal education and those with some primary education were, respectively, 85.5% and 58.3% less to correctly name the president. Age and having lost a child increase the odds of incorrectly naming the president, 3.1% and 8%, respectively.

Table 2

Binary Logistic Regression Results of Orientation to Person – President

|                          | SE  | Odds ratio | P-value |
|--------------------------|-----|------------|---------|
| Constant                 | 0.492 | 96.247     | 0.000   |
| Age                      | 0.006 | 0.969***   | 0.000   |
| Duration of residence in Agincourt | 0.004 | 0.998     | 0.687   |
| Number of deceased children | 0.031 | 0.921** 0.009 |
| Number of grandchildren residing in home | 0.026 | 1.010 | 0.714 |
| Depression score         | 0.039 | 0.970      | 0.435   |
| Sex                      |      |            |         |
| Male                     | 0.148 | 2.887***   | 0.000   |
| Female                   | --   | --         | --      |
| Married status           |      |            |         |
| Married                  | 0.133 | 1.626***   | 0.000   |
| Not married              | --   | --         | --      |
| Ever tested positive for HIV |      |            |         |
| Yes                      | 0.185 | 1.193      | 0.381   |
| No                       | --   | --         | --      |
| Ever been told to have high BP |      |            |         |
| Yes                      | 0.114 | 1.738***   | 0.000   |
| No                       | --   | --         | --      |
Table 3 shows factors associated with orientation to year. Age, number of deceased children, depression, and formal education are all negatively associated with correctly naming the year, while gender, marital status, and having been told to have high blood pressure all increase the odds of correctly naming the year. For instance, age and number of deceased children reduced the odds of correctly reporting the year by 3.7% and 9.6%, respectively. Also, compared to people with at least a secondary education, respondents with no education were 92.3% less likely to report the year correctly. Men were 3.6 times more likely to report the year correctly.

### Table 3

| Education                  | SE  | Odds ratio | P-value |
|----------------------------|-----|------------|---------|
| No formal education        | 0.374 | 1.045**   | 0.000   |
| Some primary (1-7 years)   | 0.385 | 1.417*    | 0.023   |
| Some secondary (8-11 years)| 0.689 | 2.242     | 0.242   |
| Secondary or more (12+ years) | --   | --        | --      |

*p<0.05  **p<0.01  ***p<0.001
Table 4 shows the binary logistic regression results of orientation to month. The odds of correctly naming the month are positively associated with gender, marital status, ever been told to have high blood pressure and negatively associated with age, number of deceased children, and formal education, as shown in Table 4. For example, while age reduced the odds of correctly reporting the month by 5%, respondents that had been told to have high BP were 2.2 times more likely to state the month correctly. Also, males were over twice as likely to correctly name the month compared to women.

### Table 4

Binary Logistic Regression Results of Orientation to Time – Month

|                          | SE  | Odds ratio | P-value |
|--------------------------|-----|------------|---------|
| Constant                 | 0.518 | 163.367 | 0.000   |
| Age                      | 0.006 | 0.955*** | 0.000   |
| Duration of residence in Agincourt | 0.004 | 1.008 | 0.169   |
| Number of deceased children | 0.032 | 0.924*  | 0.014   |
| Number of grandchildren residing in home | 0.027 | 1.024 | 0.363   |
| Depression score         | 0.041 | 0.991 | 0.830   |
| Sex                      |      |           |         |
| Male                     | 0.149 | 2.164*** | 0.000   |
| Female                   | --   | --        | --      |
| Married status           |      |           |         |
| Married                  | 0.138 | 1.734**  | 0.000   |
| Not married              | --   | --        | --      |
| Ever tested positive for HIV | 0.214 | 1.382 | 0.131   |
| Yes                      | --   | --        | --      |
| No                       |      |           |         |
| Ever been told to have high BP | 0.128 | 2.175*** | 0.000   |
| Yes                      | --   | --        | --      |
| No                       |      |           |         |
| Education                |      |           |         |
| No formal education      | 0.397 | 0.113*** | 0.000   |

*p<0.05  **p<0.01  ***p<0.001
Table 5

The binary logistic regression results of orientation to date are shown in Table 5. Age, number of deceased children, and education reduce the odds of correctly naming the date, while gender, marital status, ever been told to have high blood pressure, and having HIV increase the likelihood of correctly naming the date. For example, men were 3.2 times more likely to correctly state the date compared to women. Also, people who were HIV positive (odds ratio = 1.476) and those who had been told to have high BP (odds ratio = 1.314) were more likely to correctly state the date compared to their counterparts who had not ever been told to have high BP and those who were not HIV positive, respectively.

Table 5

Binary logistic regression results of orientation to time – Date

|                          | SE    | Odds ratio | P-value |
|--------------------------|-------|------------|---------|
| Constant                 | 0.403 | 105.474    | 0.000   |
| Age                      | 0.006 | 0.951***   | 0.000   |
| Duration of residence in Agincourt | 0.004 | 1.006     | 0.101   |
| Number of deceased children | 0.029 | 0.930*    | 0.013   |
| Number of grandchildren residing in home | 0.023 | 1.002     | 0.935   |
| Depression score         | 0.036 | 1.004     | 0.921   |
| Sex                      |       |            |         |
| Male                     | 0.130 | 3.165***   | 0.000   |
| Female                   | --    | --         | --      |
| Married status           |       |            |         |
| Married                  | 0.116 | 1.348**    | 0.010   |
| Not married              | --    | --         | --      |
| Ever tested positive for HIV |     |            |         |
| Yes                      | 0.182 | 1.476*     | 0.032   |
| No                       | --    | --         | --      |
| Ever been told to have high BP |    |            |         |
| Yes                      | 0.108 | 1.314*     | 0.012   |
| No                       | --    | --         | --      |
| Education                |       |            |         |
| No formal education      | 0.269 | 0.153***   | 0.000   |
Some primary (1-7 years) & 0.282 & 0.750 & 0.307  
Some secondary (8-11 years) & 0.418 & 1.338 & 0.486  
Secondary or more (12+ years) & -- & -- & --  

*p<0.05  **p<0.01  ***p<0.001

Discussion

This study examined factors that are correlated with cognitive health among aging people in Agincourt, South Africa. I was specifically interested in orientation, an aspect of memory tasks that focuses on the four measures of cognitive health a. Orientation to the year; b. Orientation to the month; c. Orientation to the date; and d. Orientation to the president. Participants were asked to name the current year, month, date, and president. Some of the findings support earlier research on factors that correlate with cognitive impairment. For instance, education has been shown to have a positive association with cognitive function (Barnes et al., 2004; Navarro et al., 2015).

In conclusion, it looks like education was also positively associated with orientation among the aging people in Agincourt. Additionally, as indicated in other studies (Mayo Clinic, 2012), women seem to be more affected by cognitive impairment than men in this study. Married respondents were more advantaged than their unmarried counterparts regarding cognitive health. Stressors such as losing a child were harmful to cognitive health as well as depression. Understanding cognition is critical for healthy cognitive improvement, as deficits arise in neuropsychological disorders. Global health challenges are associated with core cognitive problems that constitute key therapeutic objectives for early intervention. Being able to measure and monitor cognition has the potential to permit early interventions that enhance cognitive performance related to the decline in normal aging (Cambridge Cognition, 2015).

Some surprising results were also found. While people who had been told to have high blood pressure showed better cognition than those without high blood pressure, studies on the relationship between cognitive impairment and hypertension have been inconsistent. Some have shown a positive relationship, and others have a negative one. Another surprising result was the positive association between HIV and orientation to date. This could be that people with HIV were younger relative to those without HIV. The study has some limitations. Data are
cross-sectional and cannot infer causation. Also, data are self-reports, and there may be issues with social desirability. Despite these limitations, this study adds to the discourse on cognitive health among aging people in Africa. To achieve healthy aging, it is important to know factors that negatively impact cognition. More research studies are needed to fully understand the influences on cognitive impairment in Africa.

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