Assessing the Correlation between the Socioeconomic Level and Cognitive Function among Older Adults in Egypt

Macy AbouGabal
American University in Cairo, macymaher@aucegypt.edu

Follow this and additional works at: https://fount.aucegypt.edu/etds

Part of the Cognitive Psychology Commons, Community Health and Preventive Medicine Commons, Policy Design, Analysis, and Evaluation Commons, and the Public Health Education and Promotion Commons

Recommended Citation

APA Citation
https://fount.aucegypt.edu/etds/2132

MLA Citation
https://fount.aucegypt.edu/etds/2132

This Master’s Thesis is brought to you for free and open access by the Student Research at AUC Knowledge Fountain. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of AUC Knowledge Fountain. For more information, please contact thesisadmin@aucegypt.edu.
Assessing the Correlation between the Socioeconomic Level and Cognitive Function among Older Adults in Egypt

A THESIS SUBMITTED BY
Macy Maher Abou Gabal

SUPERVISED BY
Professor Mohamed Salama

TO THE
School of Sciences and Engineering

In April 2023

In partial fulfillment of the requirements for the degree
of Masters of Global Public Health
Declaration of Authorship

I, Macy Maher Abou Gabal, declare that this thesis titled, “Assessing the Correlation between the Socioeconomic Level and Cognitive Function among Older Adults in Egypt” and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.

- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.

- Where I have consulted the published work of others, this is always clearly attributed.

- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.

- I have acknowledged all main sources of help.

- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

Signed:  
Macy Maher Abou Gabal

Date:  
9-May-2023
Abstract

The number of older adults is increasing worldwide at an unprecedented rate. Some countries began to understand the challenges of aging, while others are still at the stage of comprehending the true dimensions of the situation. There is a global focus on aging research to appropriately mitigate the negative impact of aging and cognitive decline. Not only that dementia add economic pressure on governments, it also increase the psychological and physical burden of the caregivers. Scholars have previously studied socioeconomic level in three variables, namely work, education, and income, and their relationship with cognitive function. It was concluded that the work environment has a role in shaping the cognitive trajectory of the individual. Work-related stress is induced by low level of job control and high level of job demands, which reduces hippocampal activity, and fastens the aging process. On another hand, education increases the cognitive reserve that in turn stimulates brain activity and promote healthy aging. Other studies argued that personal income does not only affect the aspect of treatment affordability but also the mental health aspect of the individual. Although the majority of dementia cases reside in Low- and Middle Income countries, there are few accurate representative data for the situation. For this reason, this pilot study aims to contribute to and identify the correlation between the socioeconomic level and the cognitive performance of the aging population in Egypt. In this pilot study, data from 122 participants were collected on the course of two months, 118 of whom were included in the analysis. Although it is a pilot study, results still provided some valuable findings that would direct future scientific studies, and suggestions were provided as policy alternatives.
Acknowledgments

I would like to acknowledge with gratitude the guidance of Professor Mohamed Salama throughout the study. He introduced me to the field of global brain health, and he was always open to any discussion, and he was welcoming and encouraging my idea. Professor Salama always provided me with helpful advice and swift feedbacks. Even with his great experience in the field, he answered every novice question that I had with patience.

I would also want to thank Professor Hassan Al Fawal who allowed me to attend the applied neuroscience course to learn more about the field during my MPH.

I would like to thank the Geriatric Department at Ain Shams University as well, Assistant Professor Hany Ibrahim and Dr. Yasmin Al-Kordi, for their insights, data collection training of the cognitive assessment tool, and contribution to the study.

Additionally, I would like to thank my colleague Andrew Ashraf who contributed and showed great interest in the study.

Lastly, I would like to acknowledge Mr. Amr El Sayed who guided me with the statistical analysis of the study.
# List of Abbreviation

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>Alzheimer’s Disease</td>
</tr>
<tr>
<td>AL-SEHA</td>
<td>Longitudinal Study of Egyptian Healthy Aging</td>
</tr>
<tr>
<td>CR</td>
<td>Cognitive Reserve</td>
</tr>
<tr>
<td>FTD</td>
<td>Frontotemporal Dementia</td>
</tr>
<tr>
<td>HCAP</td>
<td>Harmonized Cognitive Assessment Protocol</td>
</tr>
<tr>
<td>LBD</td>
<td>Lewy Body Dementia</td>
</tr>
<tr>
<td>LMICs</td>
<td>Low- and Middle-Income Countries</td>
</tr>
<tr>
<td>MCI</td>
<td>Mild Cognitive Impairment</td>
</tr>
<tr>
<td>MMSE</td>
<td>Mini Mental State Examination</td>
</tr>
<tr>
<td>MOSS</td>
<td>Ministry of Social Solidarity</td>
</tr>
<tr>
<td>MD</td>
<td>Mixed Dementia</td>
</tr>
<tr>
<td>MoCA</td>
<td>Montreal Cognitive Assessment</td>
</tr>
<tr>
<td>SES</td>
<td>Socioeconomic Status</td>
</tr>
<tr>
<td>VD</td>
<td>Vascular Dementia</td>
</tr>
</tbody>
</table>
# Table of Contents

Declaration of Authorship .................................................................................. ii
Abstract .................................................................................................................. iii
Acknowledgments .................................................................................................. iv
List of Abbreviation ................................................................................................. v

1. **Introduction and Research Overview** .............................................................. 1
   I. The Beginning of Ageing Research ................................................................. 1
   II. The Global Interest in Ageing ...................................................................... 2
   III. Older Adults in Egypt .................................................................................. 2
   IV. Research Question and Aim ........................................................................ 3

2. **Literature Review** .......................................................................................... 4
   I. Dementia ......................................................................................................... 4
      a. Neurodegenerative diseases .................................................................... 4
      b. Non-neurodegenerative diseases ............................................................. 8
      c. Dementia during the COVID-19 Pandemic .............................................. 9
   II. Aging and Cognitive Function ..................................................................... 9
   III. Determinants of Healthy Aging ................................................................. 12
   IV. The Socioeconomic Status Variables ......................................................... 14
      a. Employment ............................................................................................. 14
      b. Education ................................................................................................. 15
      c. Personal Income ...................................................................................... 17
   V. Cognitive Testing and Batteries ................................................................... 18
   VI. Review of Previous Studies ....................................................................... 21
   VII. Dementia in Low-and Middle-Income Countries ....................................... 26
   VIII. Caregivers for People with Dementia ...................................................... 27
   IX. The Egyptian Policies Addressing Ageing .................................................. 28

3. **Methodology** ................................................................................................. 31
   I. Study Design and Framework ...................................................................... 31
   II. Ethical Consideration ................................................................................... 31
   III. Sampling ....................................................................................................... 32
   IV. Interviewing .................................................................................................. 33
   V. Data Analysis ................................................................................................. 33

4. **Results** ........................................................................................................... 36
   I. Sample Descriptive Analysis ........................................................................ 36
   II. Hypothesis Testing ......................................................................................... 38
5. Discussion ......................................................................................................................... 42
   I. Comparative Analysis ................................................................................................. 44
   II. Policy Recommendations ......................................................................................... 47
   III. Limitation and Recommendations ........................................................................... 48

6. Conclusion ..................................................................................................................... 49

References ......................................................................................................................... 50
Appendix .............................................................................................................................. 69
1. Introduction

I. The Beginning of Aging Research

Since 400 B.C., aging has always been an intriguing topic. Plato, the Greek philosopher, was the first to presume that there is a difference between aging and disease. On the other hand, Aristotle believed that aging leads to a decline in mental ability. However, for many years after, there was no attention on aging as people were already dying at a young age because of diseases and food shortages. Consequently, there was little interest for aging studies (Weintrob, 2022).

In 1903, the Nobel prize winner Elie Metchnikoff presented the word "Gerontology", which denotes the study of older adults. The word is taken from the Greek word geront or gerontos which means an old man; in addition to the suffix logy, which signifies science. Gerontology differs from Geriatrics, as Geriatrics means the medicine of older adults (Birren et al., 2007).

Until 1939, Scientists were studying the relationship between different mortality rates, and they concluded that mortality rates were noticeably higher in older organisms. Until an experiment on mice led to a discovery that was a breakthrough in aging research, reviving the field. The experiment was done by reducing the caloric intake of mice and they discovered that the dietary restriction increased their life span. Scientists knew that they perhaps cannot stop aging, but they can slow it down (Campisi et al., 2019).

Moving forward to the mid-1900s, researchers raised another question "Does aging cause chronic diseases". While there were studies that confirm that there is a strong correlation between aging and chronic diseases, there is no solid evidence for the causality. Additionally, in the 1950s, aging studies were taking a genetic approach and methodologies, identifying genes that play a role in longevity. Scientists were able to recognize more than 800 genes that modify the lifespan of individuals (Campisi et al., 2019). With more scientific evolution, scientists did not only understand that aging is a process that differs from one individual to another, but they knew that it varies within the individual himself. For instance, the skin and kidneys are the first organs to age, while for the brain aging is a more delayed process. We currently know that the longevity of organisms is a multifactorial complex process that relies on genetic, epigenetic, environmental, and lifestyle factors (Chmielewski, 2020). However, it is important to reflect what is the benefit of longevity without health.
II. The Global Interest in Aging

Currently, there is an increased emphasis on the topic as the modern world is demographically shifting into aging populations. Although sometimes people perceive the "aging population" as a negative term, an aging population is the outcome of the improvement of the quality of life that increased life longevity (Boggatz et al., 2009). It is expected that worldwide adults aged 60 years and above are going to reach 2 billion by 2050 (WHO, 2022). The public health issue is that two-thirds of these older adults living with dementia are present in low-middle-income countries (Mattap et al., 2021). In 2013, Japan recorded over 51000 people who were above the age of 100, compared to 153 individuals in 1963. Similarly, Britain had around 12000 people aged over 100, while it had only 2600 individuals in 1981 (Thane P., 2013). Accordingly, it is expected that an increased number of adults aged 85 years and above will be noticeable globally (Pan et al., 2019).

While these data might be socially comforting to people, seeing their loved ones present, it surely raised some concerns on the governmental level. Policymakers perceive these numbers as an economic burden. Older adults might be seen as unproductive and in need of pension as well as health and social care (Thane P., 2013). Some countries, such as Australia and New Zealand, are starting to change their mindsets and they encourage the participation of older adults in the workforce. These mentioned above countries extended the employment period of the seniors to promote their well-being and generate sustainable tax revenue for their social and medical support (Lillis & Milligan, 2017). On the other hand, policymakers will not always find the same reaction, as France is now facing massive anger and opposition with the recent rise of the pension age from 62 to 64 (The Guardian, 2023).

III. Older Adults in Egypt

There is not enough data that reflect the accurate situation in Egypt. However, there is some information that provides us with some insights. For instance, nursing homes are not tolerated by Egyptian norms. It is more frequent, particularly in middle-income families, to see the elders dependent on their families and staying with them in the household. This might add economic and psychological pressure on the families, especially since women are currently receiving higher education and they pursue careers that prevent them from staying at home. Furthermore, despite the small sample size in previously conducted studies, cardiovascular diseases,
diabetes, and arthritis were found to be the most common diseases among the older adult patients visiting the geriatric units (Boggatz & Dassen, 2005b).

To examine the Egyptian situation more closely, The Central Agency for Public Mobilization and Statistics (CAPMAS) published a recent report on older adults in Egypt in 2021. According to estimates, the expected life at birth of the Egyptians is 74.3 years. There were 6.8 million older adults in Egypt aged 60 years and above, divided into 3.6 million males and 3.2 females. The illiteracy rate among older adults in Egypt was shockingly 55.1% in 2020. Additionally, one million older adults are still working (CAPMAS, 2021). Reading the same report, a difference was spotted between Egypt and developed countries. In most developed countries, females outlived males (Thane P., 2013). According to CAPMAS, the mortality rates of females in Egypt surpassed those of males (CAPMAS, 2021).

IV. Research Question and Aim

Research has proven that environmental factors play an important role in affecting our aging process (Pan et al., 2019). From here came the question: how do Egyptians age? How can we put Egyptians on the aging equation? Is there an association between socioeconomic level and cognitive function among older adults in Egypt? Are there adequate policies that properly address the situation in the country? All these questions were put into consideration while conducting this research. This pilot study aims to reach preliminary findings on the cognitive function and overall situation of the aging population in Egypt. The aim is also to allow us to propose suggestions tailored to the Egyptian population based on the resulting data to enhance the current policies and understanding.
2. Literature Review

I. Dementia

Dementia is currently the seventh cause of death worldwide (WHO, 2021). Many individuals still believe that dementia is the normal course of aging. However, this idea is a misconception, and dementia is considered an acquired disease with many underlying causes (Gale et al., 2018). Dementia is considered an umbrella term that includes many diseases, and the most common type is Alzheimer’s (CDC, 2019). Nevertheless, the umbrella also includes other diseases, such as Lewy body dementia, frontotemporal dementia, vascular dementia, and mixed dementia. These aforementioned diseases are the neurodegenerative branch of dementia. On the other hand, there is a non-neurodegenerative branch with a better prognosis if detected early. These diseases could be of nutritional, endocrine and metabolic, or toxic origins (Ghosh, 2010).

a. Neurodegenerative diseases

A German psychiatrist called Alois Alzheimer noticed massive neuron loss and amyloid plaque accumulation while examining the brain autopsy of a patient who suffered from memory loss and a change in personality before dying. Afterward, the condition was named after this German psychiatrist who was the first to discover this condition. It is expected that by 2050, the number of individuals who will be diagnosed with Alzheimer's disease (AD) will reach 152 million worldwide (Breijyeh & Karaman, 2020). Alzheimer's is considered the most common type of dementia as it comprises around 60% of dementia cases (WHO, 2023).

AD is a progressive irreversible neurodegenerative disease that is characterized by two types of neurological changes. The first change is positive lesions, which are seen with an accumulation of amyloid plaque, neurofibrillary tangles (tau), and other deposits in the brain. The second change is a negative lesion, and it is observed in the loss of neurons and synapses in the brain (Breijyeh & Karaman, 2020). The preclinical stage of AD could start as early as twenty years before the start of symptoms. The individual could show signs of forgetfulness, story repetition, or apathy, language affection is the least affected variant (Gale et al., 2018).

The most common risk factor of AD is aging because the disease is rarely seen in the younger population; however, there are other important risk factors. Genetic factors were found
to have a significant role in developing the disease. The most familiar genes that were discovered to be related to Alzheimer's disease are Amyloid precursor protein (APP), Presenilin-1 (PSEN-1), Presenilin-2 (PSEN-2), and apolipoprotein E (ApoE) (Breijyeh & Karaman, 2020). Until now, there is no cure for AD, and the only medical intervention is administered to maintain brain health, slowing the symptoms and ameliorating the individual's behavior (CDC, 2020).

In 1912, the German neurologist Dr. Friedrich Lewy was studying Parkinson's disease in the laboratory of Dr. Alois Alzheimer when he first discovered "the Lewy Bodies" which are mainly formed of the protein α-synuclein. Scientists before were not certain about the role of this protein. However, they assumed that it has a role in cell membrane remodeling. Only in the 1990s, it was understood that the accumulation of this misfolded protein is what forms the Lewy bodies (Sanford, 2018).

Lewy body dementia (LBD) is another type of irreversible neurodegenerative dementia. LBD is more seen in males rather than females (Jezlie & Sopian, 2022). The individual diagnosed with LBD may develop symptoms of varying levels of attention, hallucinations, anxiety, rapid eye movement, dream enactment behaviors, and signs of Parkinson's, for example, muscle stiffness, tremors, and slow walking. For this reason, a one-year rule is applied to differentiate between Lewy Body Dementia and Parkinson's disease dementia. In Parkinson's disease dementia, the symptoms of motor dysfunction are perceived before the cognitive symptoms (Gale et al., 2018). Almost 85% of people living with LBD suffer from motor difficulties. Other difficulties that these individuals endure are frequent falls, gastrointestinal and urinary problems, excess sweating, and sleep disturbance (Taylor et al., 2020).

It is proposed that the progression of LBD occurs in multiple stages, and only during the later stages, is the cognitive and emotional dysfunction noticed. This theory was based on previous autopsies that showed the presence of Lewy bodies in around 10% of all brains despite the absence of any symptoms. It is believed that LBD is underdiagnosed, and it sometimes takes up to three physicians to reach an accurate diagnosis (Sanford, 2018). Another study believes that this difficult diagnosis leads to a worsening of these patients' conditions due to the uncoordinated efforts of multiple specialists (Taylor et al., 2020). Once again, there is no treatment for this neurodegenerative dementia type. The issue with the symptomatic treatment
of LBD is that administering a drug that alleviates one symptom could lead to the deterioration of another (Sanford, 2018).

The third neurodegenerative disease was first identified by Arnold Pick. Pick discovered lobar atrophy in a person who was suffering from aphasia, which is a condition where the individual's ability to communicate is affected. Later, Alois Alzheimer saw the same characteristics of the disease and he named the condition Pick's disease. For this reason, frontotemporal dementia (FTD) is also known as Pick's disease (Bang et al., 2015). Nevertheless, FTD could be also called progressive aphasia, semantic dementia, and frontal dementia of the non-Alzheimer type (Rapcsak, 2023). FTD is the third most common type of neurodegenerative dementia after AD and LBD. From its name, atrophy in the frontal and temporal cortices is seen in this condition. In the majority of cases, it affects individuals below the age of 65. Nowadays, the diagnosis of FTD has significantly improved as previously the disease was mistakingly diagnosed as a mental illness (Bang et al., 2015).

Frontotemporal dementia is categorized into behavioral and primary progressive aphasia. The behavioral variant is observed when the individual's personality starts to change. The person might do unexpected and inappropriate actions, such as approaching strangers, making sexual remarks, and urinating in public. These behaviors might reach to theft or irrational life decisions. Additionally, the person might seem more apathetic and uninterested to see family, go to work or empathize with anyone. Other people may stop reacting to pain. All these symptoms could be misdiagnosed with depression or other mental illnesses (Bang et al., 2015).

The other variant is primary progressive aphasia which is seen when the person faces difficulty with communication. However, this language difficulty may be seen as non-fluent or semantic variants. Semantic aphasia is when the person talks fluently, but one would not be able to properly comprehend the sentences due to errors in naming and grammar. The issue with non-fluent aphasia is that the words spoken are also hard to articulate (Rapcsak, 2023). Unfortunately, FTD is a fatal condition, its progression may lead to motor dysfunction because, at later stages, individuals may not be able to even eat or swallow. Individuals may also contract infections, and the most common is pneumonia (Jezlie & Sopian, 2022). Research has still not reached a treatment for FTD, and the prescribed drugs are supportive treatments to palliate the neuropsychiatric and motor symptoms (Gale et al., 2018).
The fourth irreversible type of dementia is vascular dementia. Vascular dementia (VD) has a cerebrovascular rather than a neurodegenerative origin. When cerebrovascular disease impacts the neural and cognitive function of the individual, it is then called vascular dementia. VD is the second most common type of dementia after AD. There are multiple subtypes for VD. Nevertheless, all the types are caused by cerebral ischemia that results in gliosis or demyelination of the nerves (Uwagbai and Kalish, 2022). This cerebral ischemia could be caused by smoking, diabetes, hypertension, coronary artery disease, and hypercholesterolemia. Strokes are another cause of cerebral ischemia that cause vascular dementia, and sometimes, doctors call them silent strokes when they happen without apparent symptoms (Gale et al., 2018).

Although the exact clinical symptoms of VD depend on the area which was affected by the cerebral ischemia, evidence suggests that predominantly the executive functions would be most affected. Moreover, the decreased blood supply to the brain causes memory loss (Jezlie & Sopian, 2022). Identifying VD might require a sensitive test for executive functions. Accordingly, the Montreal cognitive assessment scale would be more suitable to detect the condition, unlike the mini-mental state test. Management of the condition relies mainly on controlling the comorbidities that could lead to this disease, as well as managing the vascular risk factors (O'Brien & Thomas, 2015).

The final type to be elaborated on in this paper is mixed dementia. Previously, AD and VD were seen only as separate types of dementia. With scientific evolution, it was discovered that AD and VD crosscut in many cases, and the two conditions can indeed co-exist in one individual. This discovered condition was called mixed dementia (MD) (Langa et al., 2004). The diagnosis of MD was controversial because older adults sometimes only showed signs of AD, such as memory loss. However, pathologies of VD or LBD were then identified in autopsies (Gale et al., 2018). Mixed dementia can be seen with any type of dementia, but it is more commonly observed with AD and VD. Research is still needed in this area to understand more about this complex disease. Existing data recommends the identification of the predominant condition in MD because the treatment approach is symptomatic and preventive therapy (Custodio et al., 2017).
b. Non-neurodegenerative diseases

The second branch of dementia constitutes the non-neurodegenerative types, which have a better prognosis and could be reversible if detected early. The first condition emerges out of nutritional causes. Dementia of nutritional origin is caused by chronic alcohol intake or malnutrition, especially vitamin B12 (Thiamine) (Malik et al., 2022). During the early stage of severe Thiamine deficiency, a condition called Wernicke encephalopathy arose. Wernicke encephalopathy is characterized by neuronal damage and three clinical distinctive features, which are difficulty in walking (gait ataxia), weaknesses of the eye muscles (ophthalmoplegia), and delirium. Nonetheless, it is rare to see individuals carrying the three signs at once (Gale et al., 2018; Malik et al., 2022).

Other causes for non-neurodegenerative diseases are endocrinial and metabolic causes. The most known metabolic cause is related to the thyroid gland hormones, yet their effects are still disputable. Some studies have not established a strong relationship between the level of the hormone and dementia, while other had. For example, the carefully controlled Framingham study showed a strong association between the hormone and AD in women (Ghosh, 2010; Tan, 2008), while others failed to find an association and a clear connection between the fluctuating level of thyroid gland hormones and AD in their studied populations (de Jong et al., 2006; Ghosh, 2010). What evidence suggests is that both hypo and hyperthyroidism have a reversible effect on the individual's cognitive function. These impaired cognitive functions are apathy, attention, memory loss, and depression. Chronic exogenous administration and endogenous secretion of steroids may also have a role in cognitive impairment by affecting the hippocampal activity, as well as repeated episodes of hypoglycemia, CO2 intoxication, and hepatic systemic encephalopathy (Ghosh, 2010). Furthermore, it is observed that cognitive impairment is also associated with chronic respiratory problems, cancer, chemotherapy exposure, and hematologic diseases (Gale et al., 2018).

Toxins are another cause of the cognitive decline and dementia. Heavy usage of drugs, such as anti-cholinergic drugs (muscle relaxants), anti-depressants, and oxybutynin was found to have an association with cognitive impairment (Gale et al., 2018). Additionally, heavy metal intoxication was also found to impact cognition. A famous example is mercury. Individuals who worked in the hat-making industry were exhibiting symptoms of tremors, irritability, and slurred speech. Upon analyzing their conditions, it was found that the chronic inhalation of
mercury in their industry has led to this cognitive decline. From here the term "mad hatter" arose. Mercury intoxication can also occur from contaminated fish or dental amalgam. Other examples are arsenic and lead. An outbreak of contaminated groundwater with Arsenic in parts of West Bengal and Bangladesh has caused delirium for its consumers, while lead has been found to affect and decrease the brain volume in brain MRIs (Ghosh, 2010). Unfortunately, these toxins-based dementia can later on progress into the irreversible neurodegenerative type of dementia (Malik et al., 2022).

c. Dementia during the COVID-19 Pandemic

The outbreak of the COVID-19 virus in 2020 made all humans realize how vulnerable they are. Older adults were in particular more vulnerable than others. older people with dementia were at a higher risk of disease contraction and mortality. A review by the WHO showed that when older adults with neurodegenerative and cerebrovascular dementia contracted the SARS-CoV-2 virus, they exhibited severe symptoms of illness. older patients with dementia were also hospitalized for longer periods. It is also important to note that hypoxia the prominent clinical feature of COVID-19 leads to delirium, which adversely impairs the individual's cognitive function (WHO, 2021).

The vulnerabilities of older adults and people with dementia were highlighted at the time of quarantine because they had limited access to accurate data. They had to continuously remember to maintain a social distance, wash hands, and wear a mask while they were already facing troubles with memory and remembering. In some countries, older adults live alone or with a spouse. This was an issue because telecommunication ruled the world, and it was difficult for older adults to properly use and take advantage of telecommuting. Finally, for those individuals living in nursing homes, visits, and group activities stopped. Accordingly, older adults were socially isolated, and they lost the face-to-face contact with their family and loved ones, which caused stress. Stress was not only felt by older adults but also by the staff in nursing homes which resulted in burnout (Wang et al., 2020).

II. Aging and Cognitive Function:

During the last century, life expectancy has significantly increased. This increase is owing to access to health care, enhanced sanitation, improvement of workplace and housing conditions, and the invention of vaccination and drugs. Nowadays, geriatrics care is not the
responsibility of clinicians solely. Researchers, educators, policymakers, leaders, and many other individuals in the communities understand the need for collaborative efforts to promote healthy aging through prevention, intervention, and careful planning. Many terms are used in research to describe healthy aging, like active aging, aging well, harmonious aging, successful aging, or productive aging. Nevertheless, what is more important than choosing the term is to agree on what we want to seek from it (Friedman et al., 2019). Do we want to promote longevity? Decrease the health care costs for older adults? Do we want older adults to be able to work for more years? Studies suggest that healthy aging could be attained by a combination of optimizing physiologic and metabolic health, controlling chronic diseases, promoting cognitive and mental health, and advocating for social engagement (Lara et al., 2013).

In 1997, healthy aging was defined as aging with a high cognitive and physical ability with the absence of diseases. Nonetheless, when specialists understood that it is difficult to age without contracting any disease, the definition was adjusted to become a more realistic one. Healthy aging was described as the capacity to maintain functional ability that ensures well-being in older age (Wagg et al., 2021). As mentioned before, dementia is not the normal course of aging. The cognitive function of older adults would indeed be indeed affected by age, but it does not mean that neurons should necessarily die, and cognitive function should drastically decline. The global aim is that all older adults would be capable of living an independent healthy life and coping with normal cognitive aging. One of the multiple roles of public health in the aging field is to properly educate individuals and manage their expectations of aging, as people should not be overly pessimistic or too optimistic concerning aging (Friedman et al., 2019).

Early changes in cognition may not always be noticeable to everyone. First, the personality and motivation of the individual are important in constructing the aging trajectory. It was proven that the self-assessment of the overall health among older adults is a powerful predictor of future morbidity (Zadworna, 2022). Second, not all everyday situations require that older adults function to their maximum abilities. Third, some older adults choose to alter their lifestyles to avoid negative situations. For instance, some older adults choose not to drive at night or they maintain regular check-ups with different specialists to minimize any detrimental consequences. Finally, older adults have great experience and knowledge that compensate for the other reduced cognitive abilities (Salthouse, 2004).
Cognitive function is evaluated by five domains, namely learning and memory, language, visuospatial, executive, and psychomotor functions. When an individual shows impairment in one of these five domains, it is more likely that he will be diagnosed with mild cognitive impairment. If the person showed deterioration in more than one domain, this might be a sign of dementia. Besides the medical examination, the clinician can differentiate between mild cognitive impairment and mild dementia by completing a brief mental statuses examination, such as the Mini-Mental State Examination (MMSE), the Short Test of Mental Status (STMS), and the Montreal Cognitive Assessment (MoCA) tests. These tests may not be the perfect evaluation tools, but they are preferable to regular conversation. The most common sign of cognitive impairment is memory loss. It is human nature to forget random things like names, appointments or misplacing keys. However, when a person forgets more frequently or repeats the same questions, that might be an alarm to cognitive decline (Knopman & Petersen, 2014).

Dementia greatly affects the quality of life, and even minute cognitive changes can impact the individual's ability to execute daily life activities (Gale et al., 2018). During the early stages of dementia, the individual will face difficulties completing the tasks requiring cognitive complexity, such as preparing meals and finishing all the household chores. However, during the late stages of dementia, the individual will not be able to complete even the basic activities alone, like entering the toilet or dressing oneself. Mild cognitive impairment is known as a deficit in cognition that does not interfere with the daily lifestyle. It is important to early detect the condition to avoid its progression (Borda et al., 2018). However, the functional decline leads to an economic burden as people living with dementia will require additional care from their families or the government (Ryan & Brady, 2023). There are some risk factors for dementia, mainly age, genetics, race, traumatic brain injury, and cardiovascular problems. Nevertheless, there is no cure for dementia. The only current known approaches are treating the underlying causes, maintaining a healthy life, and promoting cognitive reserve (CDC, 2019).
III. Determinants of Healthy Aging

Aging is a biologically complex process, and each human being is unique. Current interdisciplinary efforts are aiming to put an end to the idea of one approach can fit all. Similarly, we should understand that aging is not the same linear process for everyone. However, evidence suggests that there are factors that promote healthy aging and other factors that adversely affect the aging process. Previous studies denote that many factors affect any person's health, such as physical well-being, mental and cognitive well-being, and social well-being (Abud et al., 2022). In some Westernized countries, independence is also considered a determinant of health. However, in other cultures where it is normal to see family members depend on each other, independence is not considered a strong factor (Abud et al., 2022; Thanakwang et al., 2014)

Physical well-being is constituted of physical activity, diet, and positive lifestyle behaviors. The HALE project took place in 2004 in 11 European countries to test the association between physical well-being and healthy aging. Results showed that participants who followed a Mediterranean diet did not smoke nor drink alcohol, and were moderately physically active were found to have more than 50% lower mortality rates (Knoops et al., 2004). Other studies conducted in Asia have reached the same positive association between physical well-being and healthy aging (Cooper et al., 2010; Lara et al., 2013)

Normally, to evaluate the individuals' physical activity, researchers use grip strength, walking speed, the chair rises, and standing balance tests (Abud et al., 2022). On the other hand, diet is a tricky factor because, in some poor countries, individuals do not have other options than to rely on energy-dense food. Energy-dense food is rich in saturated fats, salt, and alcohol, and poor with essential nutrients, it leads to diseases and poor health. It was proven that after 6.5 years of follow-up, the Mediterranean diet was proven to have a better impact on cognition rather than the low-fat diet (Morley et al., 2015). There has been extensive research to understand the impact of different diets, vitamins and fatty acids on accelerating or delaying dementia. During the research process, scientists discovered a two-way communication axis between the intestine and the brain called the gut-brain axis. When there is a microbial variation in the gut, a leak like syndrome in the GIT happens that provokes the immune system. The systemic inflammation could affect the blood-brain barrier, leading to neuroinflammation and neurodegenerative condition (Junges et al. 2018).
When it comes to smoking, it is more common to see individuals start smoking at a younger age, but they start to notice the adverse health consequences in middle or old age. Even during earlier studies, it was proven that the mortality rate of older adults who smoke is much higher than non-smokers (Doll et al., 2004). Going to regular physical check-ups and taking the prescribed medications are as important as any other factor in the physical well-being domain (Abud et al., 2022).

Regarding the determinants for mental and cognitive well-being, the main prominent factors are self-esteem, resilience, learning, faith, and sense of purpose. Usually, older adults who are 60 years old or above may start to feel a decline in their physical strength. They might also be distressed by reaching retirement age knowing that their income would be reduced. They might go through the death of a spouse or witness the deterioration of the spouse's health. Erikson highlights that at this age, older adults commonly pass by a developmental crisis of integrity vs. despair. In this period, the person starts to either question his life decision or accept the existing new phase. Sometimes, despair takes over individuals who are already living a healthy life only because of the emerging challenges (Erikson, 1982).

Older adults who showed symptoms of resilience and adaptation to new changes and modify their daily choices to support the new circumstances score better on overall health scales (Ploughman et al., 2012). Moreover, continuous learning or starting a new hobby was found to have a positive influence on health as it adds to the person's cognitive reserve (Thanakwang et al., 2014). Faith does not only mean religion, but also it signifies spirituality and beliefs. Faith was shown to increase motivation, which in turns support older adults in their aging process by elevating their sense of purpose (Abud et al., 2022).

The third domain is social well-being. Social well-being is discussed in the literature based on variables like social support, financial security, and community engagement (Abud et al., 2022). Social support may also be presented through emotional, physical, and financial assistance by family, friends, or even strangers. Some data even suggests that social factors are the most fundamental domain (Ploughman et al., 2012). For example, a Louisiana Healthy Aging Study closely investigated the relationship between the different age groups and social factors. Results showed a strong association between social well-being, measured by hours spent outside of the home, belonging to clubs or organizations, social support satisfaction, and improved overall health (Cherry et al., 2016). On the other hand, when loneliness is felt by
older adults, it could lead to deleterious consequences. Sometimes, individuals may live alone, but it would not be necessary for them to feel lonely. Loneliness is more of a subjective feeling towards the quality of social engagement rather than the quantity. Loneliness may lead to depression, cognitive health decline, nursing home admission, and in some cases mortality (Hawkley et al., 2008). Financial security had a mediating role in social well-being as individuals who were financially secure felt less stressed, and they were able to participate in exercise and social activities (Ploughman et al., 2012).

It is important to highlight that cultural norms and socioeconomic status effects should never be ruled out. Data reveal that each population has its characteristics and health determinants that shape its health profile. Nevertheless, data also suggests that two persons who live in the same conditions may also have different health statuses. The individual's perception of his health is also an indicator that may affect his health status (Zadworna, 2022). However, there are other emerging determinants based on social inequities. In the 1980s, there was an increase in awareness of the inequitable distribution of resources, power, and money that affect how people live, grow, work, and age. Worldwide movements were launched to address these inequities urging policymakers to take steps to promote health equity. In literature, health disparity is used to describe the health difference between segments of the same population. However, the term inequalities are often used when describing the same issue on a global level (Penman-Aguilar et al., 2016).

IV. The Socioeconomic Status

Health inequities and unequal distribution of resources is not normal condition. It is the outcome of poor policies, strategies, and unfair economic arrangements (WHO, 2008). Socioeconomic status (SES) is identified as the individual's general position in the social system, which is determined by the person's occupation, educational level, personal income, and property ownership (Galobardes et al., 2007).

a. Employment

In the late 1980s, Karasek proposed the job strain model, which is the most commonly used and widely spread model up to this day to assess the characteristics of jobs. Accordingly, the model estimates the related health outcomes for each category of job. Karasek evaluated each job according to two dimensions: job demand and job control (Karasek & Theorell, 1990). Job
demands are represented in the psychological stresses in the job that is caused by the workload, time pressure, work disruption, and concentration. On the other hand, job control is evaluated by the level of autonomy practiced and the skill needed and expanded at work (Agbenyikey et al., 2015). With the assessment of each dimension, four categories of jobs resulted, which are active, passive, low-strain, and high-strain jobs.

Karasek explained that active jobs that require high mental demands and high control do not necessarily lead to negative health outcomes as previously predicted. On the contrary, jobs that mentally stimulate the worker to add to his cognitive reserve (Then et al., 2014). Conversely, passive jobs are the ones when both the job demand and control are low, which impose a greater risk on the worker's health. Low-strain jobs are jobs that have low demand and high control, and the relaxing nature of this category may not often provide the proper mental exercise for the individual that stimulates his cognitive reserve (Pan et al., 2019). The fourth and last category is the high-strain category, which has high demands and low control. Many research findings have found an association between high-strain jobs and cognitive decline, especially in delayed verbal memory (Agbenyikey et al., 2015). Another study showed an evident cognitive decline associated with the high-strain job with female workers (Nilsen et al., 2021). An additional study elaborated that time is an important factor when we decide on the impact of high-strain jobs as long-term exposure to high-strain jobs did not have an implication on cognitive ability (Zhuo et al., 2021).

It is important to highlight that previous data showed that work-related stress can alter the chemical pathway in the body. When a person experiences a chronic high level of stress, it activates the hypothalamus pituitary adrenal axis. Accordingly, a fight-or-flight-like response results in an increased release of cortisol hormone that results in reduced hippocampal activity. Thus, an adverse effect on cognitive function will be noticed and the aging process will be accelerated (Nilsen et al., 2021).

b. Education

Moving to the non-medical factor that greatly affects the human's overall health status which is education. Prior studies suggest that education plays a role in shaping our cognitive reserve. Cognitive reserve (CR) is a protective mechanism developed throughout life by cognitive stimulation. In other words, the brain develops this protective mechanism that provides some sort of brain elasticity that compensates for damage and provides alternative
neural networks if required (Evans et al., 2018). Another theory related to education is the brain reserve theory. According to MRI indexes of older adults who completed longer years of education, their brain volume increased both microscopically and macroscopically, in terms of gray and white matter volumes. (Chen et al., 2019).

Crystalized intelligence is affected by education (Alley et al., 2007). To understand this previous statement, we first need to explain the theory of intelligence proposed in 1966. The theory proposes that there are two types of intelligence, namely crystallized and fluid. Crystalized intelligence is gained throughout life by the accumulation of knowledge, facts, skills, judgment, and understanding. On the other hand, fluid intelligence relies more on the biological factors during a younger age that helps the individual with solving problems, reasoning, and learning new techniques. The theory suggests that crystalized intelligence increases or remains as it is throughout life, while fluid intelligence decreases gradually (Horn & Cattell, 1966).

For the past decades, the importance of education has been growing based on individual decisions as well as societal and labor market demands. Data confirmed a positive correlation between high educational levels and improved cognitive function (Chen et al., 2019). However, the assessment of the educational level is a complex and sensitive process because it includes multiple variables. Although we will only focus on formal education, confounders are still needed to be considered in the assessment. For instance, the level of education may indeed have a positive correlation with healthy aging, but also the higher educational attainment may be caused by a pre-existing higher cognitive ability, or perhaps another socioeconomic factor may predominate and have a higher impact on cognitive function. Furthermore, educational attainment is not only measured by the completed years of schooling, but also by the scores, social aspect, and quality of education (Lövdén et al., 2020).

President Gamal Abdel Nasser was the one who passed the social welfare policy, which offered free education for Egyptians. However, the number of the population back then was roughly a third of the number today (El-Shaarawi, 2015). Unfortunately, modern Egypt is facing major challenges with education. In 2015, Egypt ranked 141 out of 144 countries for the quality of primary education (El-Shaarawi, 2015). In 2016, a study showed that more than half of Egyptian students do not meet the low benchmark in international assessments, whereas the teaching methods -especially in public schools- are still rigid and they do not encourage the
students to learn nor participate. The buildings do not have the proper infrastructure, and one in every five facilities was unfit for use (UNICEF, n.d.). In 2021, the State Information Service announced that the situation of pre-university education has improved and Egypt's rank in education jumped 11 places (SIS, 2022). Still, with this announced improvement, Egypt is ranked the 72nd. Thus, this situation adds another layer when studying the cognitive function of Egyptian older adults.

c. Personal Income

The third and last factor to be reviewed in this paper is personal income. Although income is as significant as other factors in the SES spectrum, many cognitive studies were focusing more on the other factors. That is because income influences the individual's ability to attain and receive proper education and health services. Accordingly, it is difficult to study the sole effect of income. However, previous studies have concluded that in many cases, income inequalities lead to anxiety, which in turn activates the stress hormones in our bodies. Therefore, the chemicals in the bodies are altered in a way similar to being exposed to a high level of stress at work as mentioned above. (Mishra & Carleton, 2015).

Income inequalities may indirectly lead to cognitive decline. Due to the imputed economic stress on the individual, one might change his lifestyle and behavior, enter into a depressive episode, stop any leisure activity, or neglect his diet (Peterson et al., 2019). Some studies denote that people will start noticing the health consequences of income inequalities on themselves after years that may take up to 16 years of latency (Kim et al., 2016). For this reason, it is important to consider the subjective element while studying personal income as the individual's feeling towards his income influences his stress level and thus, his health and cognitive status.

It is more likely that people living in wealthier conditions live in better circumstances. The shortage of resources may lead to malnutrition, poor sanitation, inappropriate housing, contaminated water, and pollution, which is associated with negative health outcomes. Consequently, it might be reflected in worsened cognitive function (Rodriguez et al., 2021). Therefore, in developing countries, people rely more on familial and community ties to compensate for the lesser resources and access to care (Muhammad et al., 2021). In 2021/2022, Egypt witnessed a 6.6% economic growth compared to the preceding year. However, Egypt is currently facing major economic hurdles as the official reserve and foreign currency assets have sharply decreased. This economic situation highly impacted the personal income and
financial self-sufficiency of Egyptians, and to alleviate the effect of high prices in Egypt, the government decided to widen its economic coverage to Takaful and Karama social programs, as well as increasing pension wages for older adults (World Bank, 2022).

IV. Cognitive Testing and Batteries

Screening tests do not explain the course or history of cognitive decline, and they are not diagnostic tools. Screening is done by a simple test at a given time to identify cases that would need a more comprehensive assessment by an expert clinician. Experts believe that an ideal test should be short and not take more than 5 minutes to complete by a well-trained individual. Earlier, it was advised that all individuals aged 70 years and above should be routinely screened, but experts also believed that 70 years is too late, and early screening since the age of 55 years is more favorable (Morley et al., 2015). There are many advantages of screening batteries. For instance, almost all tests act as rapid early detectors of cognitive impairment. Their frequent use and fast results are means of raising awareness. In the USA, the Affordable Care Act law (ACA) necessitated the use of cognitive screening tests in the Medicare Annual Wellness Visit, which in turn substantially increased the number of completed tests (Roebuck-Spencer et al., 2017). A disadvantage of these screening batteries is that it is limited when it comes to illiterate and low educated subjects (Morley et al., 2015).

The most commonly used screening batteries are the Mini-Mental State Examination (MMSE), the Six Item Screener, the Cambridge Cognitive Examination (CAMCOG), Montreal Cognitive Assessment (MoCA), CogState, MiniCog, Neurobehavioral Cognitive Status Examination (NCSE), NeuroTrax/BrainCare, St. Louis University Mental Status (SLUMS), Rapid Cognitive Screen (RCS), and CNS Vital Signs (CNSVS) (Roebuck-Spencer et al., 2017).

The MMSE is a validated short cognitive assessment test that comprises 11 questions, and it takes around 5 to 10 minutes to complete. The test is formed of two parts. The first part tests the cognitive function relying on vocal responses, while the second part tests the ability to follow verbal and written commands. The total score of the test is 30. Subjects with visual impairment may face difficulties in part 2 of the test, but their scores are adjusted (Folstein et al., 1975). The six-item screener is a one-phase test extracted from MMSE. It could be done over the telephone in less than 5 minutes. The test only needs the individual to recall 3 items and complete 3 items of orientation (Callahan et al., 2002). The CAMCOG test evaluates eight categories of cognition, which are orientation, language, memory, attention, praxis, calculation,
abstract thinking, and perception. The range of scoring in the test is from 0 to 107. CAMCOG is also partially based on MMSE, and it takes around 20 minutes to complete. The socioeconomic variables influence CAMCOG's scoring. Accordingly, it is recommended that the test should be administered with caution (Huppert et al., 1995). The MoCA test is a 10 minutes validated battery that measures attention, concentration, working memory, language, executive function, short-term memory recall, visuospatial, and orientation of time and space. The total score of the test is 30. In some studies, the MoCA test was proven to be more sensitive to cognitive impairment than MMSE (Nasreddine et al., 2005).

The CogState test is a 15-minute cognitive battery that evaluates attention, learning, memory, problem-solving, and decision-making by using cards. CogState can also be a self-administered computerized battery (Makdissi, 2001). The Mini-Cog is a very brief test composed of two items, which are three words recall and clock drawing. It takes lesser than 5 minutes to administer this test (Borson et al., 2000). The NCSE is another battery that examines the language, constructions, memory, calculations, and reasoning of the subjects. A healthy individual takes around 5 minutes to finish the test, but it takes around 20 minutes to complete for those with cognitive impairment (Kiernan, 1987). The Neurotrax battery is a computerized system that encompasses many tests to examine memory, executive function, visual-spatial skills, verbal fluency, attention, information processing, and motor skills. Neurotrax battery needs 45 minutes or more to complete (Dwolatzky et al., 2003).

The SLUMS test is an easy-to-administer test that uses 11 items to evaluate attention, calculation, immediate and delayed recall, animal naming, abstract thinking, and visuospatial skills in a short amount of time. The test has a score of 30, and it takes around 8 minutes to complete (Feliciano et al., 2013). An abbreviated version of SLUMS is RCS which needs around 3 minutes or less to finish. RCS' maximum score is 10 to evaluate three items (Malmstrom et al., 2015). Finally, CNSVS is another computerized battery that includes 7 tests, namely, verbal and visual memory, finger tapping, symbol digit coding, stroop test for information processing speed, attention shifting, and a continuous performance test. CNSVS takes around 30 minutes to finish (Gualtieri & Johnson, 2006).

Surely, negative results after cognitive screening are reassuring and relieving to hear. However, it is always important to share the negative and positive results with the individuals and their families. The management of any cognitive condition is based on group efforts.
Sometimes, older adults may forget to apply the physician's advice. Therefore, it is important to ensure that the person and his family have well comprehended the diagnosis and the plan (Morley et al., 2015).

Cognitive screening batteries are different from clinical neuropsychological evaluation. The latter provides a broader clinical picture of the individual and it is more sensitive to cognitive impairment. Additionally, it can identify the psychological conditions, and their severity, and suggests treatment. An example of the clinical neuropsychological evaluation is the Repeatable Battery for the Assessment of Neuropsychological Status. Completing this test requires more training, experience, and work to ensure an accurate diagnosis. For this reason, it is important to understand the purpose of each test and realize that each test complements the other (Roebuck-Spencer et al., 2017).

In 1992, The U.S. initiated the longitudinal Health and Retirement Study (HRS) that aimed to understand the impact of dementia on their national citizens, and properly plan their future strategies. Data were collected, and follow-ups were done every two years up to 25 years of follow-up on more than 43,000 individuals over the age of 50. HRS mainly focuses on four broad domains: income and wealth, cognition and health care services, work or retirement, and social connections. The initial HRS was targeting adults born between 1931 to 1941 for the age group 51 to 61 years old. In a year, the Asset and Health Dynamics Among the Oldest Old (AHEAD) cohort was launched to study the older age group 70 years and above for individuals born in 1890–1923. Afterward, two more studies started for the Children of the Depression (CODA), born between 1924 and 1930, and the War Babies of 1942 to 1947. These studies provided rich information on older adults' health and the social determinants impacting health. Many studies were published from the data extracted from these studies (Sonnega et al., 2014).

In around 2002, the first sub-study from HRS that focused on dementia and cognitive decline was called the Aging, Demographics, and Memory Study (ADAMS). ADAMS offered an important baseline for cognitive studies, as researchers had high-quality data on risk factors and estimates. From there, the Harmonized Cognitive Assessment Protocol (HCAP) arose. HCAP is a project that builds on the already existing information from HRS and ADAMS to upgrade the international data on cognition and highlight the risk factors for each population. Some of the sister studies of HCAP are the Mexican Health and Aging Study (MHAS), the Longitudinal Aging Study in India (LASI), the English Longitudinal Study of Ageing (ELSA),
the Chinese Health and Retirement Longitudinal Study (CHARLS), the Health and Aging in Africa: A Longitudinal Study of an INDEPTH Community in South Africa (HAALSI), the Survey of Health and Retirement in Europe (SHARE), and the Korean Longitudinal Study of Aging (KLoSA) (Langa et al., 2004). In Egypt, a longitudinal study of Egyptian Healthy Ageing (AL-SEHA) was launched as a collaborative research program between the Institute of Global Health and Human Ecology, the Social Research Center (SRC) at the AUC, and European partners from the SHARE study (Salama, 2020).

V. Review of Previous Studies

In 2009, Abdel Rahman et al. conducted a cognitive assessment test on Egyptian older adults in geriatric clubs in Cairo. The study was done over a course of 9 months in two stages on more than 200 subjects. The researchers also used MoCA and CAMCOG tests for cognitive assessment. The study reported 34.2% and 44.3% of mild cognitive impairment (MCI) cases in older men and women adults respectively. The study showed that MoCA is a reliable test and the results are correlated with the Arabic CAMCOG test. (Rahman & El Gaafary, 2009).

In 2011, Amer et al. conducted a similar study on 100 older adults for around 7 months in Mansoura city using the MoCA test and MMSE to detect cognitive impairment. They were able to identify a 32% prevalence of MCI cases within the sample. Additionally, the study demonstrated an association between cognitive decline and depression. (Amer et al., 2012).

In 2011, Khater et al. completed a similar study on 120 participants from three nursing homes in Cairo. The primary aim of the researchers was to identify the nutritional status of older adults living with mild cognitive impairment. They relied on MoCA and MMSE tests for the study, and they identified 38.3% of MCI cases (Shawky Khater & Fawzy Abouelezz, 2011). The three previously mentioned studies included illiterate participants in their study sample, and the three of them confirmed a linear association between educational level and age with cognitive function. However, Amer et al. were the only researchers who did not find a correlation between cognitive function and sex. In the other two studies, females were found to be more prone to MCI.

In Lebanon, specialists validated and used the population-based 10/66 dementia research group diagnostic assessment as a mean to learn the prevalence, incidence, and risk factors of dementia in Lebanon. The assessment comprises three steps. The first step is the screening cognitive battery, and it includes multiple sub-items and questions. The second step is a
comprehensive clinical interview to detect organic brain syndromes, anxiety or depression. The third step is an interview with the older adult’s informant for further assessment. According to literature, the test has proved its high accurate predictability (Phung et al., 2014). Specialists believed that using the MMSE will not be beneficial, as the test relies on the educational attainment. A previous rate of 86.2% was resulted with illiterate older adults aged 65 years and above, and this rate was unrealistically high. Accordingly, 10/66 is more widely used (Phung et al., 2017).

Researchers used the above mentioned 10/66 assessment on 508 Lebanese older adults and 502 informants to test the correlation between the occupation and education with dementia. The cut-off score for the Lebanese sample was 3.34. Results indicated that individuals diagnosed with dementia were found to be less educated, work less complicated jobs and they were less physically active compared to the non-demented sample (Darwish et al., 2018). Another similar cross-sectional study that evaluated the impact of socioeconomic level and cardiovascular diseases on dementia revealed a strong association between older age, income insufficiency with dementia (Chaaya et al., 2018). Another study conducted in Lebanon on 337 participants who were recruited from the Family Medicine Clinic of the American University of Beirut showed 14.8% MCI cases. Three tests were used in the Lebanese study, which are the MoCA test, the 5-item Geriatric Depression Scale, and the Lawton Instrumental Activities of Daily Living Scale. Data showed gender differences in cognitive function, as females had lesser cognitive function scores. Additionally, higher educated levels correspond to better cognitive function among Lebanese participants as well (Assaf et al., 2021).

In South Africa, HAALSI was launched to monitor chronic health diseases in the population. HAALSI studied cognitive function, dementia as well as cardiovascular diseases and HIV. The study recruited adults starting from age 40 years old. The reason behind the inclusion of this young age is that the life expectancy in South Africa is low, and the aim to recognize the pre-disease pathways. Individuals were recruited for one year from 2014 to 2015 from 31 villages. The research process and interviews were completed with 5059 adults. Each interview took more than two hours to complete. Results from HAALSI regarding the cognitive assessment indicates that individuals with non-formal education had lower cognitive function than those who completed formal education (Gómez-Olivé et al., 2018) Further analysis of results demonstrate that SES had a direct effect of the cognitive function, and an indirect effect by altering the person’s health status, behavioral factors, and social networks. The cognitive
function of the South African sample is prone to decline with older age and lower income. An interesting finding is that higher cognitive function was perceived among overweight and obese participants compared to normal body weight persons (Mutola et al., 2023).

In many studies, researchers studied the impact of occupation on cognitive decline by using Karasek's model. Taking as an example the Framingham Offspring cohort study in the USA. Initially, the study started in 1971 and longitudinal follow-ups took place. The total number of participants was 1429, with an average age of 46. The average working years of experience of the sample was 24. Karasek's theory was tested on the sample, and the findings were concurrent with Karasek's theory that chronic stress at the workplace leads to a decline in cognition. The younger age group of the participants was found to be more affected by job stressors regarding verbal learning and memory. This study suggested that the most favorable work condition is the one that has high control over decisions at work regardless of the age category of the employee. This latitude helps the worker to overcome the challenges of demands. Accordingly, the employee will be cognitively stimulated, and he would not have time to dwell over failures and mistakes as he will be moving on to the next challenge (Agbenyikey et al., 2015).

Another study was conducted on pensioned French individuals using the GAZEL cohort which started in 1989. In the published study, the sample extracted from the 2010 follow-up constituted 2149 participants. The study also tested Karasek's theory while using multiple cognitive tests including the MMSE. The results also found a strong correlation between higher cognitive function and job control and an inverse correlation between cognitive function and job demands. The findings also conformed with the previous study in finding that the best cognitive function can be attained with high job demands because they are mentally stimulating only when combined with high-job control (Sabbath et al., 2016).

In 2019, another published cohort study in Sweden evaluated the effect of work stressors on cognitive function. The sample was extracted from the Swedish National Study on Aging and Care-Kungsholmen, and it was formed of 2,937 participants aged 60 years and above living in the Kungsholmen District of Stockholm. Follow-up was carried out for 12 years from 2001 to 2004. The study used the MMSE test and Karasek's model to test the hypothesis and they found that low-demand jobs were associated with a more rapid decline of disabilities in old age. The study also emphasized the role of the social factor at work. When high-strain jobs are
coupled with low social support, it leads to disability progression. While high strain was not associated with the same disability progression with people who have high social support at work. For this reason, besides autonomy, it is important for employees to feel supported and acknowledged for enhanced cognitive function (Pan et al., 2019).

A longitudinal study was conducted in Finland aiming to identify the risk factors of cognitive impairment. The study showed a 6.1% prevalence of mild cognitive impairment among participants aged 65 to 79 years old. Initially, the study sample was extracted from the Finnish Multinational Monitoring of Trends and Determinants in Cardiovascular Diseases since 1972. Follow-ups were carried out for 21 years. The researchers wanted to study whether there was an association between elevated cholesterol levels, hypertension, and MCI. The test used in the study was MMSE. The study findings showed a correlation between MCI, lower educational level, high cholesterol, and elevated systolic blood pressure (Kivipelto et al., 2001).

A Colombian study conducted on 150 older adults aged 65 to 74 years while using the MoCA test clarified that the test is highly associated with education, and it needed adjustments to truly detect cognitive impairment instead of low-quality education. Researchers believe that the MoCA test is biased for formal education, and it could falsely report mild impairment (Gómez et al., 2012). Similarly, another study conducted on different nationalities of Hispanics in the USA reported that it was necessary to add 3-4 points to the MoCA scores to accommodate for the lower educational level of the participants (Zhou et al., 2015). It is advisable to consider the number of schooling years as they differ from country to country. For instance, the average schooling years in Norway is 11.8 years, 11.6 years in Canada, and only 5.5 years in Colombia. The mean MoCA score for the Colombian sample was 17.3. If the cut-off points were applied to the Colombian sample, then 95.5% of the studied sample would have had a cognitive malfunction. Many studies found a correlation between educational level and cognitive function (Gómez et al., 2012).

The English Longitudinal Study of Ageing (ELSA) has been taking place since 2002 for older adults aged 50 years and above in England. Follow-ups with the participants were done every two years, while medical check-ups are performed every four years. More than 18000 individuals participated in the study since its start, and wave 9 was conducted in 2018/2019. Usually, two interviews are conducted in ELSA. The first one is completed with the study respondent who is the older adult to assess a wide range of cognitive functions, and the
interview takes around one hour to finish. The second interview is with the study informant who is the family member, friend, or caregiver of the respondent. This interview takes around 20 minutes to complete, and it aims to identify the general health of the respondent and identify any changes in cognition from another perspective. The published article in 2021 contained the completed information of wave 1. The study was able to detect around 14% of respondents with MCI. The article also exposed evident gender differences among the sample. Men had higher educational attainment and wealth than women. The social determinants of men were found to be better among males. For instance, the number of married men was higher than married women, which resulted in women feeling lonely. Consequently, the cognitive well-being of women was affected, and they experienced difficulties completing household tasks (Cadar et al., 2021).

In 2020, the SHARE project's wave 6 provided an overview of cognitive impairment and its risk factors showing that the prevalence of cognitive impairment in 17 European countries and Israel was about 30%. This is an increase in percentage as wave 4 of the SHARE study reported 25.4% cognitive impairment. Regarding nutrition, it was found that underweight individuals were twice as likely to develop cognitive impairment compared to obese and overweight individuals. This finding was in line with HAALSI’s results. On the other hand, an HCAP report that evaluated the cognitive function of 3496 participants aged 65 years and above from HRS found a 22% prevalence of MCI among the participants. Similar to other studies, HCAP found that people with MCI scores were older in age or finished lesser years of schooling, and there was no association with gender. A characteristic finding in HCAP was that dementia and MCI were more commonly identified among Black and Hispanic older adults (Manly et al., 2022).

For MexcCog, the study done in Mexico constituted 2042 individuals aged 50 years and above. The study established a direct association between the years of education and cognitive function. However, wealth and income did not show a statistically significant association with cognitive function in both studies (Saenz, 2022). A similar study in Singapore was done on 114 participants using MoCA and MMSE tests. The hypothesis was to test whether hearing impairment could affect the score on cognitive testing or not. The study found 34.2% criteria of MCI among its participants on the MoCA test scale. MoCA was more sensitive in detecting MCI compared to MMSE. There was an association between hearing impairment and cognitive decline. However, it was argued that the reduced cognition might be caused by the information...
degradation hypothesis where the sensory impairment elevates the burden on cognitive processing. For this reason, it was advised on considering confounders during designing of the study and use an additional test relying on visual abilities to avoid over-referrals and false positive diagnoses (Lim & Loo, 2018).

VI. Dementia in Low-and Middle-Income Countries

An earlier community-based study conducted on 932 older adult Nigerians did not detect any case of dementia among the subjects. This result suggested that it is difficult to detect dementia outside North America, Western Europe, Australia, and Asia. The authors also suggested that environmental factors played a role in disease development. Due to the lack of evidence-based data, the situation of dementia in LMICs remained unclear. In 1998, 20 countries built a research network and they called it the 10/66 dementia research group. Data were collected in 1999 and continued for three follow-up waves. This study confirmed that dementia is the leading contributor to disability and care dependence among older people in LMICs. Although dementia is under-recognized, undisclosed, and poorly managed in LMICs, data still show that two-thirds of people who live with dementia currently live in LMICs (Ferri & Jacob, 2017). There is certainly a public health awareness wave for dementia in LMICs, but reliable literature is still exclusive to high-income countries. We cannot assume that the dementia prediction models for high-income countries would conform to LMICs (Stephan et al., 2020)

Symptoms of cognitive decline are falsely considered as a part of normal aging in LMICs. It is customary for individuals to tolerate the cognitive decline of older adults as families' expectations tend to decrease for aging older adults. However, studies showed that the rate of dementia has significantly decreased in high-income countries, which indicates that dementia could be prevented by the right approaches. Raising awareness and primary prevention may be the cheapest method of combatting dementia. Unfortunately, policies in LMICs are rigid, which does not promote effective preventive and care measures (Ferri & Jacob, 2017). On the other hand, many institutions will be under-resourced offering low-quality services by poorly equipped and trained personnel (Kane et al., 2018).
VII. Caregivers for People with Dementia

In 2019, informal caregivers spent around 89 billion hours looking after older adults living with AD only. If it is assumed that a full-time employee works around 2000 hours per year. Then, caregiving for AD patients only would require 45 million workers worldwide. The cost of caregiving for demented individuals is catastrophic, especially in LMICs who lack appropriate resources (WHO, 2021). In most cultures in LMICs, families are expected to care for older adults in their families. Care providers may uphold this role out of love, beliefs, social pressure, or a sense of responsibility or guilt. There is a stigma that follows individuals who seek the support of nursing homes. Moreover, due to improper health care services, families often rely on the private sector, which adds an economic burden on the caregiver (Ferri & Jacob, 2017). In LMICs, around 77% of caregivers are women. This might be a problem given that women are receiving better education and more opportunities in the labor market.

There is no doubt that the consequences of cognitive decline add stressors to caregivers. Previous studies elaborated that caregiver often experience psychological disturbance, financial hardship, physical health ailment, relationship distress, and constraint regarding social activities. This continuing pressure may limit the caregiver's capacity in looking after the older adult (Donaldson et al., 1997). Sometimes, caregivers are referred to as the second patients, given that they are more prone to adopt deleterious habits, such as smoking, alcohol drinking, exercise neglect, and poor sleep. Accordingly, caregivers are at a higher risk of cardiovascular diseases and poor immunity responses (Brodaty & Donkin, 2009). Care providers are expected to support daily needs, ensure adequate food intake, accompany to physician appointments, manage medications, and assist with finance. Besides all these responsibilities, the caregiver still needs to take after home, work, spouse, or children responsibilities. One thing for sure is that with all these mandatory responsibilities, the majority of caregivers did not receive proper training to enable them with correct information, approaches, and skills (Brodaty & Donkin, 2009).

Some studies suggest that burnout increases with time like a wear and tear phenomenon due to the increase in demands and burdens. Others believe that burnout remains constant because caregivers adapt to the stressors. A study proposed that the driving status of the older adult is significantly associated with the level of burden. older adults with dementia who stopped driving add more load on the caregivers (Connors et al., 2020).
In 2019, Abd El Razek et al. completed a study on the state of psychological morbidity of among caregivers of Egyptian individuals with dementia using the Zarit Burden Interview (ZBI). First, the study found a contradiction between other cultures and the Egyptian cultures. In the Egyptian culture, the majority of caregivers were the children of individuals with dementia and only a few the spouses. In non-dementia condition, the caregivers were more spouses than children. The results showed that caregivers for people with dementia were under a significantly higher burden than non-dementia caregivers. The factors affecting the severity of burnout were the duration, and intensity of the caregiving tasks, and moderate and late dementia stages required more caregiving effort than the other stages. The level of burnout was not associated with the socioeconomic factors. There was no statistically significant difference between the different age groups, educational level, working status or income among caregivers (El Razek et al., 2019). A similar study was done in Lebanon by the 10/66 Dementia Research Group using also the ZBI assessment. The study also added to the hypothesis that in Arab cultures the percentage of female caregivers surpasses those of males. The highest level of burden amidst the Lebanese caregivers was noticed with caregivers who provided the hands-on care tasks (Chaaya et al., 2017).

In 2022, a published article demonstrated that a five steps training program was delivered to caregivers of demented older adults. The study highlighted the importance of education because after completion of the educative program, caregivers’ levels of depression and anxiety were reduced by 10% for each issue (Abdelzaher et al., 2022). Caregiving is certainly a difficult role, and more attention should be directed to it in LMICs to avoid a future older adult generation with more comorbidities.

**VIII. Egyptian Policies Addressing Ageing**

Egypt ranks as the most populated country in the Middle East and the third most populous country in Africa. It is expected that by 2050, 20 million individuals would be considered older adults in Egypt (Sweed & Maemon, 2014). The country is one of the lower middle-income countries. The age of retirement in Egypt is 60 years. However, there are currently proposals to change the age of retirement to 65 years by 2027. Perhaps then, the concept of old age may also be re-defined. The research field has shown an increased interest in aging studies, but funding and scarce data are hindering its advancement. This research was able to identify 10 studies in multiple governorates in Egypt published from 1998 to 2016, which were able to
detect cognitive impairment and dementia using tests, such as MMSE, MoCA, and SLUMS (Odejimi et al., 2020). On the public policy level, the Ministry of Social Solidarity (MOSS) is the responsible institution to provide social care and protection to all age groups. Given that older adults are a vulnerable sector of society, the ministry released a report describing the interventions for older adults (MOSS, 2021).

Egypt has a national strategy for aging published in 2015. However, the strategy does not discuss autonomy, as older adults aged 65 years and above are twice as likely to feel that they do not have control over their life decisions. Furthermore, the strategy does not address the multiple forms of violence that the elders are subjected to nor how to stop it. The strategy does not advocate for education other than topics related to retirement (UNFPA, 2021). According to Article 83 in the Egyptian constitution, Egypt is obligated to ensure the health, economic, social, cultural, and entertainment rights of the elderly people. The government must provide appropriate pensions that guarantee a decent life and encourage their participation in public life. Additionally, the state will consider the needs of the elderly, and it will encourage the participation of non-governmental and civil societal agencies for the benefit of older adults (SIS, n.d.). Unfortunately, upon searching for representative data that demonstrates the Egyptian policies, plans, and current situation, there were little reliable data. Much information was published in online newspapers, and recent updates were hard to find. Moreover, more reports were found by international organizations rather than the government.

Nevertheless, according to MOSS, the ministry supervises almost 168 nursing homes in 22 governorates, 52 physiotherapy centers, and 191 clubs. There are around 3000 older adult residents in nursing homes, and around 37,000 individuals benefiting from the social activities in the day clubs. In 2019, an initiative called "The Homeless Elderly" was launched aiming to provide shelter, food, and basic needs for homeless older adults. During this initiative, 5000 individuals received the needed services (MOSS, 2021).

On top of the list of people who benefit from the pension of social insurance by the government are older adults (Sweed & Maemon, 2014). Egypt has cash transfer programs as well to support older adults, especially since the poverty rate in Egypt started to rise. For instance, Takaful and Karama program which is a collaboration between the government and the World Bank provides financial support to the vulnerable, and among them are the elderly. Around 400,000 elders benefited from the Karama program (World Bank, 2015).
government passed a law that older adults aged 70 years and above are exempt from paying public transportation fees, and those aged 65 years and above should only pay half of the ticket price. In response to COVID-19, elders were able to receive the vaccination at home. Furthermore, a Higher Committee for elder care was established to properly plan, develop, and synchronize existing strategies for older adults.

According to the Ministry of Health, 13 geriatric healthcare centers all around Egypt also include clinical diagnostic services for dementia (Sweed & Maemon, 2014). Despite all these public sector interventions and efforts, during interviews conducted years ago with elders, the subjects demonstrated a lack of knowledge regarding the services directed to them, especially the difficult access to health services (Sabry, 2005).

In 2016, it was estimated that there are fewer than 200 geriatricians, and around 857 non-governomental entities dedicated for senior citizens in Egypt. The number of specialists is much lower than the need, while the societies had different roles and objectives to reach the well-being of older adults. The Geriatric and Gerontology department at Ain Shams university established the The Egyptian Society of Geriatrics and Gerontology in 2014. They aimed to provide the proper medical treatment directly to older adult patient, train the various health specialists to be able to hand geriatric issues and to empower the stakeholders with accurate information for effective decision making as Egypt is facing a major hurdle due to scarce accurate data (Abdul-Rahman & El Said, 2016). Another example is set by Beni Suef University by launching the National Institute of Longevity Elderly Sciences (NILES). The project aims to provide enough multidisciplinary training to matches to the changing needs of care of older adults (Beni Suef University, n.d.). Other examples are Mansoura and Alexandria Universities that provide gerontological nursing studies (Mansoura University, n.d.; Alexandria University, n.d). The available information suggests that the basic needs of Egyptian older adults are hardly being met, or perhaps there is a lack of monitoring, evaluation efforts by the public sector to accurately evaluate the correlation between effort and demands? In all cases, it is vital to start asking constructive questions to build efficient strategies.
3. Methodology

I. Study Design and Framework

This study was a quantitative cross-sectional pilot study that aimed to assess the correlation between socioeconomic level and cognitive function among older adults in Egypt. The objectives of this study are to contribute to the existing literature and build a preliminary theory to improve the attitudes and understanding of the current dementia level and probable risk factors for the Egyptian population. Moreover, this study had a qualitative arm by asking the subjects subjective questions for in-depth assessment.

The primary investigator in this pilot study participated in AL-SEHA. As previously mentioned, the sister study of HCAP, AL-SEHA, is a collaborative program between SHARE, the Global Health and Human Ecology, and the SRC at the AUC. The data collection phase of AL-SEHA started in late 2021, but before data collection, training was conducted for three months. The training was done virtually and in-person to all data collectors to increase their knowledge, skills, and efficiency and for test validation. The primary investigator earned the capacity building on survey methodology and data collection certificate. Additionally, the participation in data collection for AL-SEHA was the primary investigator’s first experience in the aging research field.

Next, the thesis questions have been raised. What are the risk factors for dementia in the Egyptian population? Does the socioeconomic level affect the cognitive function of older adults? How do older adults perceive their jobs? What recommendations can we suggest to the policymakers to decrease the existing gaps?

Accordingly, in 2022, the research framework was built in two parts. The first part was extracted from AL-SEHA questionnaire to assess the three variables of the SES, which are occupation, education, and income of the participants. The questions from AL-SEHA that evaluate the SES were both objective and subjective questions to be able to include the participants’ opinions and thoughts. The second part of the study is the cognitive assessment section. The tool used to detect cognitive impairment was the Montreal Cognitive Assessment Test (MoCA). MoCA was used for its simplicity and high sensitivity. Also, MoCA was proven to be more sensitive to mild cognitive impairment than MMSE.
After combining the different parts of the questionnaire, adjustments were made to facilitate the interviews, decrease redundancies, and encourage active and honest engagement of the participants. These adjustments were made after discussions with the study advisor and specialists from the geriatric department at Ain Shams University. For instance, given that income is a sensitive subject, and in AL-SEHA questionnaire the income question was asked bluntly, an adjustment was made to give the participants multiple choices to select between the different income categories. Another question was added to ask about the availability of health insurance. For the MoCA test, the validated Egyptian Arabic version of the test was provided and used. The Arabic version of the MoCA test is identical to the English version. The only difference is in the repetition task where in the Arabic version participants are asked to repeat two sentences commonly used in the Arabic culture. The proposal defense was done on 9-Oct-22 at the AUC campus. The proposal was accepted by the thesis advisor and three faculty members of the Global Health and Human Ecology program. (See Appendix B)

A team of surveyors was gathered with the support of the thesis advisor to facilitate the data collection process. However, consensus on data collection had to be reached before the start of the study to minimize human error. Therefore, online training was delivered by a specialized psychologist from the geriatric department at Ain Shams University to accurately perform the MoCa test. The whole questionnaire was tested by the team before the start of the actual data collection. Afterward, the data collection process started in January 2023.

II. Ethical Consideration

Before data collection, the consent form was developed. The consent form explained the objectives of the study and provided the necessary personal information of the primary investigator for any questions or feedback. The consent form also ensured that all shared data by the participants are guaranteed to be confidential, and will be used for scientific research purposes only. Afterward, an application was sent to the Institutional Review Board at the AUC describing the study, highlighting that it has no risk to subjects and attaching all relevant documents. The approval was received on the 4th of November 2022 as case# 2022-2023-052. (See Appendix C and D)
III. Sampling

The sampling method used in this study was convenient sampling to obtain quicker data on the target population. The initial target was to reach 100 participants. The inclusion criteria in the study were that participants must be Egyptians, educated, aged 50 years and above, and with work experience in Egypt only. Although it was discussed whether uneducated older adults could participate in this study or not, it was finally agreed to exclude them from this study because illiteracy has a considerable effect on the performance of cognitive batteries. For the exclusion criteria, other than the illiteracy factor, older adults with severe cognitive impairment were excluded because they would not be able to respond to all the questions objectively.

IV. Interviewing

Owing to the presence of a research team, data were collected from different areas. First, participants who fit the criteria from the surrounding community were included in Cairo, Giza, and Fayoum. Second, a nursing home in Maadi, Cairo was approached, and many older adults agreed to participate in the questionnaire, whether they were residents or visitors. Third, different employees in a school in Beni Suef also agreed to contribute. Fourth, many older adult patients visiting Ain Shams Hospital and other outpatient clinics gave consent to answer the questionnaire. The time frame for data collection process took around two months, until the end of February 2023.

Interviews were done face-to-face with the participants. The average time for one interview took from 10 to 15 minutes. Each participant sat individually with the data collector and was asked to read carefully and sign the consent form. The researchers answered any questions that the participants had. The participants answered the questionnaire, which was printed on 6 pages. The final documents are stored with the primary investigator in a locked cabinet.

The interviews were conducted as follows. First, the participant was numerically coded by the data collector. For biodata recordings, the participant was asked about his birthdate, educational level, and marital status. Then, the participant was asked about his current occupational status. According to the answer to the employment status, the data collector asked the corresponding questions that probe the socioeconomic status of each category. For
example, individuals who were working at the time of data collection were asked questions from Q5 to Q13. Also, working individuals were asked to answer subjective questions to rate multiple aspects of their jobs; these subjective questions were presented in a table in Q32. Older adults on pension were asked questions from 14 to 22. Unemployed older adults were asked from Q23 to 26. Ill individuals were requested to answer Q27 to 30. Finally, housewives were asked to answer one question, which is number 31 (See Appendix A).

Afterward, the MoCA test was completed with the participant to assess his/her cognitive function. The MoCA test is a highly sensitive cognitive assessment tool that evaluates short-term memory, visuospatial abilities, executive functions, attention and concentration, the orientation of time and place, language, naming, and abstraction. To elaborate, short-term memory is tested by delayed word recall. The respondent is asked to repeat five words after completing other parts of the test. Executive function and visuospatial are tested when the participant is asked to complete trails and draw a cube and a clock that reads 10 minutes past 11:00. Attention and concentration are evaluated by repeating forward and backward digit spans, clapping when he hears a certain letter and decreasing 7 from 100 five times. Orientation of time and place is evaluated by asking the respondent to say the date and place. Language is tested by sentence repetition and verbal fluency. Naming is done by asking the respondent to name the three animals shown in the pictures. Finally, abstraction is evaluated when the participant can identify the commonality between two different objects. The test has a total score of 30. Participants who score 26 and above are considered normal, whereas 18 to 25 indicates mild cognitive impairment, 10 to 17 is considered a moderate cognitive impairment, and below 10 is an indication of severe cognitive impairment.

It is important to note that individuals who completed below 12 years of education were granted an additional one mark in their MoCA score.

V. Data Analysis

The raw data was collected from the surveyors, and revised by the primary investigator. In the case of inquiry regarding a score in a MoCA test, Dr. Yasmin Elkordi, the psychologist, was asked for consultation or adjustment. One participant was excluded due to incomplete data collected, two others were also excluded because they worked in the Gulf area, and one was excluded as he did not meet the age criteria at the time of the interview, resulting in a total of 118 included participants. Two master sheets with coded answers were completed for the
sample. The first one contained all the gathered socioeconomic information of all the participants along with their MoCA scores. The second one only included the participants who were working, their subjective answers regarding their jobs, and their MoCA scores.

An in-person meeting was conducted with Mr. Amr ElSayed from the SRC on the AUC campus to discuss the research aim and prospects of data analysis. All statistical analyses in the study were done using IBM SPSS Statistics for Windows, version 23.0. Armonk, NY: IBM Corp. The research question was answered using occupation, education, and income as independent variables, while the dependent variable was the cognitive assessment score. The standard characteristics, such as the median, frequency, and percent were completed for the socioeconomic variables. For all analyses, multiple comparisons in ANOVA and t-test were used to detect significant differences between means. Linear regression test was done to test the correlation between the educational level, occupational status and MoCA score. Additionally, crosstab analyses were done to further understand the relationship between the different variables.


4. Results

I. Sample Descriptive Analysis

During the data collection period, information was gathered from 122 participants; however, two respondents were excluded because they worked in the Gulf countries, one participant was excluded due to missing information, and one was excluded because he did not meet the age criteria at the time of the interview. Accordingly, the study sample consisted of 118 participants from 10 governorates in Egypt, namely Alexandria, Asiat, Beheira, Beni Suef, Cairo, Fayoum, Giza, Menoufia, Qalubia, and Sharqia governorates. The highest number of responses was from Cairo, and the lowest was from Menoufia. (See Figure 1)

![Figure 1: Geographical Distribution of Sample](image)

The normality test revealed that the data were normally distributed. T-test and ANOVA were accordingly used in SPSS. Data were presented as median, range, and standard deviation. Females comprised 47.5% of the study sample, which indicates a fair representation of both sexes. The age of the participants began from 50 years and above at the time of the interviews. The descriptive analysis of the participants is presented in Table 1. The mean MoCA score for female participants was 22.21, while the mean for male participants was 21.74. There was no statistically significant difference between the MoCA scores with different marital statuses. Statistics revealed that 73.7% of the sample had mild cognitive impairment, 9.3% were moderate, 0.8% were severe, and only 16.1% were within the normal range of cognition. (See Figure 2). Individuals from the 50-59 and 60 to 69 age
groups had significantly better MoCA scores than those aged 70 and above ($p < .003$ and $p < .002$).

Table 1. Descriptive Statistics of the Participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Sample Size (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>F</td>
<td>56</td>
<td>47.5</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>62</td>
<td>52.5</td>
</tr>
<tr>
<td>Age</td>
<td>50 to 59 yrs</td>
<td>58</td>
<td>49.2</td>
</tr>
<tr>
<td></td>
<td>60 to 69 yrs</td>
<td>45</td>
<td>38.1</td>
</tr>
<tr>
<td></td>
<td>70 yrs and above</td>
<td>15</td>
<td>12.7</td>
</tr>
<tr>
<td>Education</td>
<td>Basic</td>
<td>8</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>63</td>
<td>53.4</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>47</td>
<td>39.8</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Divorced</td>
<td>6</td>
<td>5.1</td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>91</td>
<td>77.1</td>
</tr>
<tr>
<td></td>
<td>Never Married</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>Separated</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>Widowed</td>
<td>17</td>
<td>14.4</td>
</tr>
<tr>
<td>Employment Status</td>
<td>Employed</td>
<td>62</td>
<td>52.5</td>
</tr>
<tr>
<td></td>
<td>Housewife</td>
<td>14</td>
<td>11.9</td>
</tr>
<tr>
<td></td>
<td>On Pension</td>
<td>36</td>
<td>30.5</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>6</td>
<td>5.1</td>
</tr>
</tbody>
</table>

Figure 2: The flow of respondents in the pilot study
II. Hypothesis Testing

To test the thesis hypothesis, univariate analyses were done with each independent variable of the SES to test its association with the MoCA score. For the occupation, statistics showed that employed participants had higher scores than the older adults on pension ($p < .004$), while there was no statistically significant difference among the other work statuses, presented in Table 2. Of the working sample, 55% had more than 35 years of experience. 59.7% reported that they worked more than 40 hours per week. 55% of the employed sample were working in the service sector, and agriculture was the least represented sector. Additionally, 71% of the working participants held supervisory roles, and 66% of them were benefiting from insurance at work.

Table 2: Comparative Analysis between the Different Employment Statuses and MoCA Score

<table>
<thead>
<tr>
<th>Employment Status</th>
<th>Employment Status</th>
<th>Mean Difference</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>Housewife</td>
<td>1.689</td>
<td>1.067</td>
<td>0.116</td>
<td>-0.43 - 3.80</td>
</tr>
<tr>
<td></td>
<td>On Pension</td>
<td>2.209*</td>
<td>0.756</td>
<td>0.004</td>
<td>0.71 - 3.71</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>1.237</td>
<td>1.542</td>
<td>0.424</td>
<td>-1.82 - 4.29</td>
</tr>
<tr>
<td>Housewife</td>
<td>Employed</td>
<td>-1.689</td>
<td>1.067</td>
<td>0.116</td>
<td>-3.80 - 0.43</td>
</tr>
<tr>
<td></td>
<td>On Pension</td>
<td>0.520</td>
<td>1.136</td>
<td>0.648</td>
<td>-1.73 - 2.77</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>-0.452</td>
<td>1.760</td>
<td>0.798</td>
<td>-3.94 - 3.03</td>
</tr>
<tr>
<td>On Pension</td>
<td>Employed</td>
<td>-2.209*</td>
<td>0.756</td>
<td>0.004</td>
<td>-3.71 - 0.71</td>
</tr>
<tr>
<td></td>
<td>Housewife</td>
<td>-0.520</td>
<td>1.136</td>
<td>0.648</td>
<td>-2.77 - 1.73</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>-0.972</td>
<td>1.590</td>
<td>0.542</td>
<td>-4.12 - 2.18</td>
</tr>
<tr>
<td>Unemployed</td>
<td>Employed</td>
<td>-1.237</td>
<td>1.542</td>
<td>0.424</td>
<td>-4.29 - 1.82</td>
</tr>
<tr>
<td></td>
<td>Housewife</td>
<td>0.452</td>
<td>1.760</td>
<td>0.798</td>
<td>-3.03 - 3.94</td>
</tr>
<tr>
<td></td>
<td>On Pension</td>
<td>0.972</td>
<td>1.590</td>
<td>0.542</td>
<td>-2.18 - 4.12</td>
</tr>
</tbody>
</table>

The mean MoCA score for the employed participants was 22.8, and 79% of these participants had mild cognitive impairment. Almost 60% of the working older adults work more than 40 hours per week and 19.4% work two jobs. The sectors in which the participants were working are present in Table 3. Of the working older adults, 83% reported that they were satisfied with their jobs, 56% felt supported and 48% felt acknowledged and could develop their skills. On the contrary, 58% felt pressured at work, 54% did not have autonomy at work, 50% felt that their income is insufficient, and 43% do not feel that there are adequate promotion chances. Finally, 45% were neutral about insurance. Further details are presented in Table 4.
Table 3: Sectors of Employed Participants

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sample Size (n)</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>Commercial</td>
<td>6</td>
<td>9.7</td>
</tr>
<tr>
<td>Health</td>
<td>8</td>
<td>12.9</td>
</tr>
<tr>
<td>Industrial</td>
<td>9</td>
<td>14.5</td>
</tr>
<tr>
<td>Service</td>
<td>34</td>
<td>54.8</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>6.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>62</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 4: Impression towards current job

<table>
<thead>
<tr>
<th></th>
<th>Agree</th>
<th></th>
<th>Disagree</th>
<th></th>
<th>Neutral</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
<td>Frequency</td>
<td>Percent</td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>Job Satisfaction</td>
<td>52</td>
<td>83.9</td>
<td>4</td>
<td>6.5</td>
<td>6</td>
<td>9.7</td>
</tr>
<tr>
<td>Physical Demands</td>
<td>28</td>
<td>45.2</td>
<td>20</td>
<td>32.3</td>
<td>14</td>
<td>22.6</td>
</tr>
<tr>
<td>Work Pressure</td>
<td>36</td>
<td>58.1</td>
<td>17</td>
<td>27.4</td>
<td>9</td>
<td>14.5</td>
</tr>
<tr>
<td>Job Autonomy</td>
<td>17</td>
<td>27.4</td>
<td>34</td>
<td>54.8</td>
<td>11</td>
<td>17.7</td>
</tr>
<tr>
<td>Skills Development</td>
<td>30</td>
<td>48.4</td>
<td>15</td>
<td>24.2</td>
<td>17</td>
<td>27.4</td>
</tr>
<tr>
<td>Support at Work</td>
<td>35</td>
<td>56.5</td>
<td>7</td>
<td>11.3</td>
<td>20</td>
<td>32.3</td>
</tr>
<tr>
<td>Acknowledgment</td>
<td>30</td>
<td>48.4</td>
<td>12</td>
<td>19.4</td>
<td>20</td>
<td>32.3</td>
</tr>
<tr>
<td>Income Sufficiency</td>
<td>22</td>
<td>35.5</td>
<td>31</td>
<td>509</td>
<td>9</td>
<td>14.5</td>
</tr>
<tr>
<td>Inadequate Promotion Chances</td>
<td>27</td>
<td>43.5</td>
<td>11</td>
<td>17.7</td>
<td>24</td>
<td>38.7</td>
</tr>
<tr>
<td>Insurance Satisfaction</td>
<td>23</td>
<td>37.1</td>
<td>11</td>
<td>17.7</td>
<td>28</td>
<td>45.2</td>
</tr>
<tr>
<td>Early Retirement Plan</td>
<td>6</td>
<td>9.7</td>
<td>35</td>
<td>56.5</td>
<td>21</td>
<td>33.9</td>
</tr>
<tr>
<td>Health Status Affects Work</td>
<td>11</td>
<td>17.7</td>
<td>38</td>
<td>61.3</td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>62</td>
<td>100</td>
<td>62</td>
<td>100</td>
<td>62</td>
<td>100</td>
</tr>
</tbody>
</table>

For the on-pension sample, their mean MoCA score was 20.6. When they were asked about how they felt regarding being on pension, 47% reported that they felt relieved, while 20% felt both relieved and anxious, as presented in Table 5. 55% of the pensioned sample had more than 35 years of experience in the labor market, and 74% held supervisory positions. The supervisory roles were in different sectors, health, journalism, engineering, banking, industrial, and others. Of the housewives, 64% were staying at home to take care of the children, and 21%
Results
did not want to enter the labor market. The mean MoCA score of the former housewives sample was 22.3 compared to the mean MoCA score for the latter which was 19.2.
For the unemployed sample, 83% reported that the last time they held a job position was more than a year ago. Half of the unemployed sample’s reason for unemployment is resignation, 16% held informal jobs, and 33% were unable to work due to medical conditions.

Table 5: impression of the sample toward pension

<table>
<thead>
<tr>
<th>Impression</th>
<th>Sample Size (n)</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxious</td>
<td>5</td>
<td>14.7</td>
</tr>
<tr>
<td>Both</td>
<td>7</td>
<td>20.6</td>
</tr>
<tr>
<td>Neither</td>
<td>6</td>
<td>17.6</td>
</tr>
<tr>
<td>Relief</td>
<td>16</td>
<td>47.1</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>100</td>
</tr>
</tbody>
</table>

The second variable tested with the cognitive score was the educational level. The high educational level showed significantly higher levels of statistical difference compared to the basic and secondary educational levels ($p < .002$ and $p < .02$). The mean difference between the various education levels is presented in Table 6.

Table 6: Comparative Analysis between the Different Educational Levels and MoCA Scores

<table>
<thead>
<tr>
<th>Education</th>
<th>Education</th>
<th>Mean Difference</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td>Basic</td>
<td>Secondary</td>
<td>-2.673</td>
<td>1.353</td>
<td>0.051</td>
<td>-5.35</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>-4.264*</td>
<td>1.328</td>
<td>0.002</td>
<td>-6.89</td>
</tr>
<tr>
<td>Secondary</td>
<td>Basic</td>
<td>2.673</td>
<td>1.353</td>
<td>0.051</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>-1.591*</td>
<td>0.682</td>
<td>0.021</td>
<td>-2.94</td>
</tr>
<tr>
<td>High</td>
<td>Basic</td>
<td>4.264*</td>
<td>1.328</td>
<td>0.002</td>
<td>1.63</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>1.591*</td>
<td>0.682</td>
<td>0.021</td>
<td>0.24</td>
</tr>
</tbody>
</table>

The third and final variable is income. The income was divided into two categories, which are income currently taken by the working sample and the income that the on-pension class used to receive. For the older adults on pension, 7 of them refused to answer the income question or were not able to remember. Accordingly, statistics were done with the available data. In the case of the working participants, the group which earns 9000 EGP and above had significantly higher statistical differences than the other two income categories ($p < .001$ and $p$
Results

< .005). For the on-pension class, the class that earned 9000 EGP and above had only a higher significant difference with the lowest income class which is 1000 to 5000 EGP ($p < .03$). Table 7 represents further statistical data for the income.

Table 7: Comparative Analysis between the Different Income Levels and MoCA Score

<table>
<thead>
<tr>
<th>Income of Employed</th>
<th>Income of Employed</th>
<th>Mean Difference</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 to 5000 EGP</td>
<td>5000 to 9000 EGP</td>
<td>-0.545</td>
<td>0.730</td>
<td>0.458</td>
<td>-2.01</td>
</tr>
<tr>
<td></td>
<td>9000 EGP and above</td>
<td>-3.870</td>
<td>1.103</td>
<td>0.001</td>
<td>-6.08</td>
</tr>
<tr>
<td>5000 to 9000 EGP</td>
<td>1000 to 5000 EGP</td>
<td>0.545</td>
<td>0.730</td>
<td>0.458</td>
<td>-0.91</td>
</tr>
<tr>
<td></td>
<td>9000 EGP and above</td>
<td>-3.325</td>
<td>1.150</td>
<td>0.005</td>
<td>-5.63</td>
</tr>
<tr>
<td>9000 EGP and above</td>
<td>1000 to 5000 EGP</td>
<td>3.870</td>
<td>1.103</td>
<td>0.001</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td>5000 to 9000 EGP</td>
<td>3.325</td>
<td>1.150</td>
<td>0.005</td>
<td>1.02</td>
</tr>
</tbody>
</table>

Using the linear regression model, the results also confirmed the previous statistics as shown in table 8. Regression estimates that for each one point in the MoCA test scored by a participant with basic education, a participant with high education scores 3.9 points ($p < .003$). Additionally, while comparing the employed participants with all other occupational statuses, it was seen that employed participants score 1.7 more than all other statuses ($p < .006$).

Table 8: Linear Regression model for education, occupation and MoCA scores.

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>17.958</td>
<td>1.239</td>
<td>14.496</td>
<td>0</td>
</tr>
<tr>
<td>Secondary Education</td>
<td>2.432</td>
<td>1.318</td>
<td>0.323</td>
<td>1.845</td>
</tr>
<tr>
<td>High Education</td>
<td>3.943</td>
<td>1.296</td>
<td>0.534</td>
<td>3.043</td>
</tr>
<tr>
<td>Employed</td>
<td>1.778</td>
<td>0.637</td>
<td>0.241</td>
<td>2.793</td>
</tr>
</tbody>
</table>
5. Discussion

Nowadays, there is an increased interest in aging research given that the world is shifting into aging populations. This pilot study provided preliminary findings on Egyptian older adults, that there is a correlation between the socioeconomic status and the cognitive function for the Egyptian population as well. Data showed that 73.7% of the study sample had mild cognitive impairment, and 9.3% had moderate cognitive impairment. Although it was mentioned above that Egypt is currently facing educational and economical obstacles, 73.7% of mild cognitive impairment was a number worth further probing.

Primarily, results showed that employed older adults had better cognitive function than those on pension. This finding is in line with Karasek’s theory that jobs stimulate mental capacity and add to the individual's cognitive reserve. Yet, 79% of these working older adults already had mild cognitive impairment. Therefore, employed participants were asked to scale their impressions and perceptions regarding their jobs to test Karasek’s model. To some extent, the results of the scales contradicted the job demand and control models. Almost 84% reported that they are satisfied with their jobs, and a great number of participants felt that they find the needed support, acknowledgment, and autonomy in tasks as well as the capacity to develop their skills at work. These traits indicated that the participants had high job control in their jobs. Based on these results, one will suppose that many jobs belonged to the active or low-strain job categories. Thus, it was important to dig deeper into the contradiction in the Egyptian context.

Results regarding occupation indicate that the participants’ jobs do not provide enough mental stimulation, faith is prevalent in subjective answers, and other factors may predominate the occupation in affecting cognitive function.

The previous finding leads us to the second variable which is income. This study shows a positive correlation between high income, especially starting from 9000 EGP and above, and better cognitive function compared to the other income scales. However, the effect of current and previous incomes was closely investigated. It was revealed that the cognitive function of pensioned older adults who earned 9000 EGP or more was only better than those who earned 1000 to 5000 EGP, and it was not different from those who earned 5000 EGP or more. In other
words, the difference in cognitive function was only observed among the two extreme salary scales among pensioned older adults.

On the other hand, the cognitive function of the individuals who currently work and earn 9000 EGP or more is higher than the other two income groups. This finding implies that the value of the income has indeed fluctuated throughout the years, affecting the individual’s quality of life. Given that the value of 5000 to 9000 EGP salary scale years ago had better implications on cognitive function in comparison with those earning the same amount of money during the present day.

This study showed that there is a correlation between income and cognitive function in the Egyptian context as well. However, it is known that income affects many variables, such as education, housing, sanitation, and health services. It is difficult to track the exact footprint of the income on each aspect of lifestyle. For this reason, the multi-facet role of income makes it difficult to understand its direct effect on cognitive function. This conclusion is concurrent with previous research comparing 22 countries that underwent the SAGE study by the WHO (Rodriguez et al., 2021).

In this pilot study, 50% of the highly educated participants were females, and almost half of each age category had high education. Statistics of this representative sample showed that there was an evident association between educational level and cognitive function. Individuals who attained high educational levels by finishing bachelor or postgraduate studies had significantly better cognitive scores than those who only completed basic or secondary education. Not only this but also there was an association between individuals with higher educational levels and better monthly incomes. While taking a deeper look into the data of individuals with moderate cognitive impairment, it was observed that 63.6% of them only completed secondary education, while 27.2% completed only basic education in school.

Other studies assessing cognitive function while using the MoCA test also established a strong association between cognitive impairment and lower education levels (Borda et al., 2018). As previously mentioned, a study in Colombia clarified that the MoCA test is highly associated with education, and adjustments are needed to truly detect cognitive impairment instead of low-quality of education. In this study, one mark was added to individuals who completed below 12 years of education. However, this recommended remark by previous
studies might be the reason for the high reported number of mild cognitive impairments in the Egyptian context. Nevertheless, evidence still suggests that education is a highly important factor that affects cognition (Lee et al., 2002).

**Comparative Analysis**

The first noteworthy finding is that this study showed a statistically significant difference between the different age groups. Even though 60% of the individuals aged 70 years and above reached a high educational level, and the majority held supervisory roles in their jobs, their cognitive function was still lower than the remaining sample. This result corresponds with the data that low-and-middle-income countries will include a higher number of people living with dementia (Mattap et al., 2021).

Previous evidence supported that job control had a positive impact on cognitive function (Agbenyikey et al.; 2015, Pan et al., 2019; Sabbath et al., 2016). In the Lebanese context, results were found to be in accordance with the developed countries, and individuals holding complex stimulating jobs were found to have better cognitive scores (Phung et al., 2017). Thus, it was important to dig deeper into the contradiction in the Egyptian context. A recent study evaluated job satisfaction among study participants in formal jobs, and it added that participants mainly exhibited higher satisfaction with stable jobs and higher wages; study participants did not complain about commuting time to work, nor workload (Ezzat & Ehab, 2019). For working non-wagers, a prior study highlighted that it was difficult to hold proper positions, and better opportunities were held by males rather than females (Roushdy and Assad, 2008).

Egypt's culture and traditions are linked to beliefs and spirituality. As mentioned above, faith is positively associated with mental and cognitive well-being. It is common in Egypt's culture to be tolerant of difficult socioeconomic situations. Accordingly, it was logical to find a great number of responses that expresses satisfaction even though the study results suggest high-strain work environments. This theory might be confirmed by the fact that half of the sample's monthly income range from 1000 to 5000 EGP because it is challenging to fulfill a family's basic needs in the current economic situation with this amount. Another result that might confirm this theory is that 45% of the participants were indifferent concerning insurance
plans and benefits. This might be because 33% of the individuals were not enrolled in any insurance plan in the first place.

An interesting common finding between the results of this study and the study conducted in Lebanon is that both studies were able to identify better cognitive function among non-working housewives who were taking care of children. This was interpreted by Phung et al. that perhaps the mental stimulation was attained by the engagement with children during homework and leisure activities. This might be considered as a cultural factor to be considered for future research (Phung et al., 2017). Another similarity between the two contexts is that one third of each sample believe that the income is insufficient, and lower income was attributed to poorer cognitive function (Chaaya et al., 2018). The similarities in findings between the two contexts might also explain the high MCI rate in this Egyptian pilot study. Given that in the Lebanese context, MMSE was not used based on the unrealistically high detection of dementia cases, because MMSE is impacted by the educational attainment, and 10/66 research group assessment was used instead. The MoCA test used in this pilot study is even more sensitive to MCI detection than MMSE.

This pilot study was in accordance with the findings of the three previous Egyptian similar studies in terms of findings that lower educational level and advanced age are associated with a higher prevalence of mild cognitive impairment. However, in this study, there was no statistically significant difference between the cognitive function of the two sexes. To the best of our knowledge, the only study that did not find a correlation with gender was in 2011 by Amer et. al. The other two studies found that females are more prone to cognitive decline than males. It was argued by Khater et. al. that this might be because women had fewer educational opportunities than men (Amer et al., 2012; Rahman & El Gaafary, 2009; Shawky Khater & Fawzy Abouelezz, 2011). However, it can be argued that these studies were conducted around a decade ago, and a new generation of older adults with better educational attainment were included in this study.

Other studies conducted in Egypt used the MMSE test with their subjects, and they were studying the association between cognitive decline and depression symptoms as well (Odejimi et al., 2020). From previous literature analysis, this pilot study is the first to conduct an overview of the three socioeconomic variables' effect on the Egyptian older adult population.
Finland has one of the top education systems in the world, still, their study found an association between the educational level, older age, and cognitive function similar to the Egyptian context. There was no statistically significant difference between males and females. The study was also able to identify a correlation between mild cognitive impairment and high cholesterol levels. It is important to note that the limitation of this study is the use of the MMSE test which has a lower sensitivity to mild cognitive decline compared to the MoCA test (Kivipelto et al., 2001). In concurrence with the Colombian study, a great number of MCI was detected in the study sample, which indicates the probability of the educational factor bias in the test (Gómez, et al., 2012). It is hard to tell whether education has a protective factor on cognitive skills by adding to the cognitive reserve, or if the detected cognitive differences among the population are a call to modify the way of testing elderly patients in different cultures (Borda et al., 2019).

The study in Singapore focused on the significance of confounders because researchers argued that the reduced cognition might be caused by the information degradation hypothesis where the sensory impairment elevates the burden on cognitive processing. Although the cut-off score for the MoCA score in this study was ≤22 to accommodate the impairment, and interviews were conducted in a well-lit and sound-treated room to facilitate communication MoCA test still detected 34.2% MCI (Lim & Loo, 2018). These were all factors that were not treated in the current pilot study as some Egyptian participants were interviewed at their workplaces (schools and offices). Perhaps the surrounding environment might have improved the results of the current pilot study.

The SHARE project was also in line with this current study. Results showed that Western and Northern Europe had better cognitive scores and function compared to Southern and Eastern Europe. The cognitive function varied among countries based on their socioeconomic differences, such as education and healthcare systems. Similar to this pilot study, participants who completed more than 12 years of schooling in the SHARE project were associated with better cognitive function. Results also confirmed the positive association between physical well-being and better cognitive function. Additionally, SHARE found that older age is more associated with cognitive decline (Barbosa et al., 2021).
Discussion

ELSA study was in accordance with this pilot study in finding an association between education and cognitive function. However, ELSA and the Lebanese study conducted at the American University in Beirut were able to detect gender cognitive function differences among the sexes, as females were more likely to develop MCI, which was not detected in this study (Cadar et al., 2021). The pilot study was also concurrent with HAALSI, HCAP, MexCog, and the Lebanese study regarding the linear association between educational level and cognitive function. However, this study was able to detect an association between income and cognitive function, which opposes MexCog’s results.

Policy Recommendations

From the literature review and study done in this research, it was concluded that the socioeconomic level indeed has a role in shaping every human’s cognitive function. In many countries, extensive aging studies and research plans are currently conducted and being carried out since the 1990s or even before. Governments encourage scientific research. As previously mentioned, the USA has the Affordable Care Act law that necessitates the use of cognitive batteries for early detection of cognitive impairment. Other governments facilitate the cooperation and harmonization of research programs between countries for the sake of the international exchange of scientific information. In Egypt, the MoSS declares on its website that it is committed to taking steps for the well-being of older adults and other vulnerable groups. However, no objectives or clear plans are shared with the public. The scientific field in Egypt is eager to learn more about cognitive function and its risk factors among the populations. Nevertheless, there is not enough financial and procedural support by the high powered stakeholders. It is recommended to mandate a comprehensive geriatric assessment in Egypt and establish a solid database.

The WHO recommends the inclusion of dementia in the ministry portfolio (WHO, 2021). Every country should tailor its action plan based on the characteristics of its population. Although Egypt is currently facing financial burdens, it is essential to invest in the aging field to avoid the wastage of future finances. It is recommended to allocate a sustainable fund for scientific research as an active action plan. Additionally, It is suggested to form a specialized council or unit constituted of interdisciplinary specialists who will be dedicated to bringing all concerned ministries, entities, and different stakeholders together. The council will be
Discussion

responsible for maintaining effective communication, engagement, planning, implementation of activities, and monitoring the overall situation in Egypt. Moreover, it is essential to publish frequent reports and engage the public in each process and create a database. This will definitely increase and aid in prevention of cognitive decline and dementia. Prevention is an efficient and inexpensive method to promote public health. Finally, another useful method to increase prevention is by including civil society, community leaders, and the private sector in the issue as a means to increase social coverage.

Limitation and Recommendations

To one’s knowledge, this study is considered one of the many studies assessing the cognitive function of older adults in Egypt. However, there were of course some limitations. The first limitation is the fact that the study is a pilot study. The timeframe did not allow for the inclusion of more participants or a more representative sample. A longitudinal study would of course be more representative. The second limitation is the geographic coverage of the research sample. Most of the participants were from Cairo since interviews had to be done face to face. The third limitation is that the MoCA test is only a screening tool, and a clinical diagnosis is essential to prove the hypothesis.

In future studies, it is preferable to concentrate on one variable and conduct a thorough assessment of the variable for in-depth assessment and representation. Given that a comprehensive analysis would require a lot of time, and participants may be uninterested to participate in long interviews and assessment. Also, further adjustment of AL-SEHA questionnaire and the addition of other questions may be needed to conform to the Egyptian culture. It is advisable to use a wealth index instead of monthly income because the true value of the currency is fluctuating. Asking extensive questions related to income is necessary, even if participants refuse to answer, to collect information about the multiple aspects of income. Finally, it is also recommended to administer two cognitive tests, if the time frame of the interviews, for more accurate results.
6. Conclusion

Within the limitations of this study, it can be concluded that Egyptian older adults’ cognitive function is associated with their socioeconomic level. Employed individuals had better cognitive function than those on pension, which coincides with the theory that job demands stimulate cognitive function. Individuals with mild cognitive impairment were found to be low-educated participants or with less income. Results showed that 73.7% of the sample had mild cognitive impairment. Accordingly, additional research is needed to refute whether the MoCA test is truly biased toward high-quality education, or if it accurately depicted the true situation of cognitive function among older adults in Egypt. In all cases, action plans by the government and research projects are needed to fill the void in the Egyptian context.
Reference


Beni Suef University. (n.d.). *Beni Suef University National Institute of Longevity ... - bsu.edu.eg*. Available at: https://www.bsu.edu.eg/Backend/Uploads/PDF/elderly/curriculum.pdf


https://doi.org/10.1111/j.1365-2702.2005.01277.x


https://doi.org/10.1016/j.ijnurstu.2009.05.006


https://doi.org/10.31887/DCNS.2009.11.2/hbrodaty


https://doi.org/10.1093/ije/dyaa227


Cooper, R., Kuh, D., Hardy, R., Mortality Review Group, & on behalf of the FALCon and HALCyon study teams. (2010). Objectively measured physical capability levels and mortality: Systematic review and meta-analysis. BMJ, 341(sep09 1), c4467–c4467. https://doi.org/10.1136/bmj.c4467


Ferri, C. P., & Jacob, K. S. (2017). Dementia in low-income and middle-income countries: Different realities mandate tailored solutions. PLOS Medicine, 14(3), e1002271. https://doi.org/10.1371/journal.pmed.1002271


Available at: https://doi.org/10.22452/jummec.sp2022no1.6.

and Therapeutic Implications. JAMA, 292(23), 2901.
https://doi.org/10.1001/jama.292.23.2901

Lara, J., Godfrey, A., Evans, E., Heaven, B., Brown, L. J. E., Barron, E., Rochester, L.,
https://doi.org/10.1016/j.maturitas.2013.07.007

Lee, S. et al. (2002) Education, other socioeconomic indicators, and cognitive
Available at: https://pubmed.ncbi.nlm.nih.gov/12697575/.


Lim, M. Y. L., & Loo, J. H. Y. (2018). Screening an elderly hearing impaired population for
mild cognitive impairment using Mini-Mental State Examination (MMSE) and

Psychological Science in the Public Interest, 21(1), pp. 6–41. Available at:

https://doi.org/10.1136/bjsm.35.5.354
Malik, R., Kalra, S., Bhatia, S., Harrasi, A. A., Singh, G., Mohan, S., Makeen, H. A.,
Albratty, M., Meraya, A., Bahar, B., & Tambuwala, M. M. (2022). Overview of
therapeutic targets in management of dementia. *Biomedicine & Pharmacotherapy*,

Malmstrom, T. K., Voss, V. B., Cruz-Oliver, D. M., Cummings-Vaughn, L. A., Tumosa, N.,
point-of-care screening for dementia and mild cognitive impairment. *The Journal of
Nutrition, Health & Aging, 19*(7), 741–744. [https://doi.org/10.1007/s12603-015-0564-2](https://doi.org/10.1007/s12603-015-0564-2)

Manly, J.J. *et al.* (2022) “Prevalence of dementia and mild cognitive impairment in the
United States: Findings from the Health and Retirement Study (HRS) Harmonized
Cognitive Assessment Protocol (HCAP) project,” *Alzheimer's & Dementia, 18*(S11).
Available at: [https://doi.org/10.1002/alz.068351](https://doi.org/10.1002/alz.068351).

Mansoura University. (n.d.). *Gerontological nursing*. Available at:
09 May 2023).

Mattap, S.M. *et al.* (2021) “Economic burden of dementia studies in low- and middle-
icome countries (LMICS): A systematic review,” *Alzheimer's & Dementia, 17*(S10).
Available at: [https://doi.org/10.1002/alz.051980](https://doi.org/10.1002/alz.051980).

Morley, J. E., Morris, J. C., Berg-Weger, M., Borson, S., Carpenter, B. D., del Campo, N.,
Dubois, B., Fargo, K., Fitten, L. J., Flaherty, J. H., Ganguli, M., Grossberg, G. T.,
Malmstrom, T. K., Petersen, R. D., Rodriguez, C., Saykin, A. J., Scheltens, P.,
Tangalos, E. G., Verghese, J., … Vellas, B. (2015). Brain Health: The Importance of
Recognizing Cognitive Impairment: An IAGG Consensus Conference. *Journal of the American Medical Directors Association*, 16(9), 731–739.

https://doi.org/10.1016/j.jamda.2015.06.017


Rapcsak, S.Z. (2023) “Elder Care,” The University of Arizona College of Medicine Tucson. Available at: https://doi.org/https://aging.arizona.edu/sites/default/files/2023-02/Frontotemporal%20Dementia.pdf.


https://doi.org/10.1016/S2214-109X(20)30062-0


https://doi.org/10.1016/S1474-4422(19)30153-X

https://doi.org/10.2147/CIA.S66069


UNICEF. (n.d.). Education. Available at: https://www.unicef.org/egypt/education


Weintrob, G. (2022) History of aging research, History of Aging Research. Colorado State University. Available at: https://www.research.colostate.edu/healthyagingcenter/2022/02/21/history-of-aging-research/


WHO. (2023). Dementia. Available at: https://www.who.int/news-room/fact-sheets/detail/dementia#:~:text=Dementia%20results%20from%20a%20variety,60–70%25%20of%20cases.


Appendix A
Thesis proposal defense approval

Approval of Thesis Research Proposal

Student Name: Hany Hakim Abu Ghalal
Student AUC email address:
Program: Master of Global Public Health (MHPH)
Thesis Title: Assessing the correlation between the socioeconomic level & cognitive function in older adults in Egypt

We hereby approve the thesis research proposal for the above student, entitled <Thesis Title>

Graduate Program Director Signature:

Approval of other Program Faculty Members (if any):
Name: Seham Elmarayd
Signature:

Name: Sorya Ach
Signature:

Name: Mohamed Sulame
Signature:
## Appendix B

The questionnaire used in the study

**Part 1: Questions extracted from AL-SEHA to evaluate the SES**

### Questionnaire in Arabic

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. حضرتك اولدت في شهر إية؟ وسنة كام؟</td>
</tr>
<tr>
<td>2. إيه هي آخر شهادة تعليمية حصلت عليها؟</td>
</tr>
<tr>
<td>3. ما هي حالة الاجتماعية حاليًا؟</td>
</tr>
</tbody>
</table>

### Questionnaire in English

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Your age?</td>
</tr>
<tr>
<td>2. What is your highest educational qualification?</td>
</tr>
<tr>
<td>3. What is your current marital status?</td>
</tr>
</tbody>
</table>

### Table

<table>
<thead>
<tr>
<th>Date of Birth</th>
<th>Educational Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>لا يعرف</td>
<td>لا يعرف</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table

<table>
<thead>
<tr>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
</tbody>
</table>

### Table

<table>
<thead>
<tr>
<th>Marital Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
</tbody>
</table>

### Table

<table>
<thead>
<tr>
<th>What is your current marital status?</th>
</tr>
</thead>
<tbody>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
</tbody>
</table>

### Table

<table>
<thead>
<tr>
<th>What is your highest educational qualification?</th>
</tr>
</thead>
<tbody>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
<tr>
<td>لا يعرف</td>
</tr>
</tbody>
</table>

### Notes

1. You may have a higher education or the tone (Questions to questions 5)
2. You may have a higher education or the tone (Questions to questions 5)
3. On the survey or the tone (Questions to questions 5)
4. You may have a higher education or the tone (Questions to questions 5)
5. You may have a higher education or the tone (Questions to questions 5)
6. You may have a higher education or the tone (Questions to questions 5)
<table>
<thead>
<tr>
<th>السؤال</th>
<th>الإجابة</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. صناعي</td>
<td>للباحث: إذا كانت الإجابة يعمل لصالحه أو للأسرة، للغير اسأل ما يلي:</td>
</tr>
<tr>
<td>2. خدامي</td>
<td>1. ما هو عملك بالضبط؟ (للباحث: أكتب اسم العمل)</td>
</tr>
<tr>
<td>3. زراعي</td>
<td>2. هل حضرتك بتعمل أكثر من شغلية واحدة حالياً؟</td>
</tr>
<tr>
<td>4. تجاري</td>
<td>3. إذا كانت الإجابة نعم: ممكن حضرتك تقولي أي هو عملك الثاني؟</td>
</tr>
<tr>
<td>5. آخر خدمة</td>
<td>السنة...</td>
</tr>
<tr>
<td>6. في أي سنة بدأت العمل؟</td>
<td></td>
</tr>
<tr>
<td>7. يا ترى طبيعة شغلك تتطلب أنك تتناول كام ساعة كل أسبوع؟</td>
<td></td>
</tr>
<tr>
<td>8. عدد الساعات...</td>
<td></td>
</tr>
<tr>
<td>9. هل حضرتك مسؤول عن/ أو يشرف على عاملين آخرين في عملك؟</td>
<td></td>
</tr>
<tr>
<td>10. هل حضرتك تتابع لتأمين صحي مع عملك؟</td>
<td></td>
</tr>
<tr>
<td>11. هل حضرتك مسجل بيوم/ أو يشرف على عاملين آخرين في عملك؟</td>
<td></td>
</tr>
<tr>
<td>12. هل حضرتك تطول من عملك</td>
<td></td>
</tr>
<tr>
<td>13. دواليب ممكن حضرتك تقولي أيه دخلك الشهري؟</td>
<td></td>
</tr>
<tr>
<td>14. للباحث: إذا كانت الإجابة (على المعاش) اسأل ما يلي:</td>
<td></td>
</tr>
<tr>
<td>1. ينتمي إلى 1000 إلى 2000 جنيه مصري</td>
<td></td>
</tr>
<tr>
<td>2. من 2000 إلى 3000 جنيه مصري</td>
<td></td>
</tr>
<tr>
<td>3. من 3000 إلى 4000 جنيه مصري</td>
<td></td>
</tr>
<tr>
<td>4. من 4000 إلى 5000 جنيه مصري</td>
<td></td>
</tr>
<tr>
<td>5. من 5000 إلى 6000 جنيه مصري</td>
<td></td>
</tr>
<tr>
<td>6. فوق 6000 جنيه مصري</td>
<td></td>
</tr>
</tbody>
</table>

السورية
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>في أي سنة حضرتك بطلت الشغل أو طلعت معاش؟</td>
</tr>
<tr>
<td>16</td>
<td>حضرتك قدنت في الشغل ده كام سنة؟</td>
</tr>
<tr>
<td>17</td>
<td>وحضرتك كنت بنشغل مش ايه؟</td>
</tr>
<tr>
<td>18</td>
<td>هل حضرتك كنت مسؤول عن/ أو يشرف على عاملين آخرين في عملك؟</td>
</tr>
<tr>
<td>19</td>
<td>هل الشغل ده كان في القطاع العام؟</td>
</tr>
<tr>
<td>20</td>
<td>ممكن حضرتك تقولي السبب الرئيسي ان حضرتك حاليا علي المعاش؟</td>
</tr>
<tr>
<td>21</td>
<td>من ساعة ما خرجت علي المعاش، بادي المعاش اداكل إحصاس بالراحلة ولا باللفق؟</td>
</tr>
<tr>
<td>22</td>
<td>ممكن حضرتك تقولي كان كام متوسط دخلك الشهري من العمل؟</td>
</tr>
<tr>
<td>23</td>
<td>للنهاح: لو المشترك (لا يعمل حاليا) أصل حاليا هل ممكن حضرتك تقولي أنه السبب الرئيسي لك مش بتشغل حاليا؟</td>
</tr>
<tr>
<td>24</td>
<td>هل حضرتك تقولي امشي أخر عمل حضرتك اشتهتها؟</td>
</tr>
</tbody>
</table>

#### أسباب اخرى (حدد) 
1. بلوغ سن المعاش
2. عرض على المعاش المبكر (مع حوافز إضافية)
3. اعمال داikk (حدد)
4. الانتهاء (إحصاء بالراحلة واللفق)

#### جينية مصرية 
1. من 1000 الى 3000
2. من 3000 الى 5000
3. من 5000 الى 7000
4. من 7000 الى 9000
5. من 9000 الى 12000
6. فوق 12000

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>لأن محل عملك أعظم</td>
</tr>
<tr>
<td>2</td>
<td>استلمت</td>
</tr>
<tr>
<td>3</td>
<td>تم الاستعما علك</td>
</tr>
<tr>
<td>4</td>
<td>بالاتفاق بينك وبين صاحب العمل السابق</td>
</tr>
<tr>
<td>5</td>
<td>كانت وظيفتك مؤفقة وانتهت</td>
</tr>
<tr>
<td>6</td>
<td>سبب آخر (حدد)</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>من شهر</td>
</tr>
<tr>
<td>2</td>
<td>من 3-6 شهور</td>
</tr>
<tr>
<td>3</td>
<td>من سنة</td>
</tr>
<tr>
<td>4</td>
<td>أكثر من سنة</td>
</tr>
</tbody>
</table>
## Appendix

<table>
<thead>
<tr>
<th>رقم</th>
<th>شرح</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>حضرتك كنت بشتوت ايه؟</td>
</tr>
<tr>
<td>2</td>
<td>25. ممكن حضرتك تقولي كان كم متوسط دخلك الشهرى من العمل؟</td>
</tr>
<tr>
<td>3</td>
<td>26. حضرتك فقدت فتاك لا تعمل بسبب المرض والعجز، هل السبب في هذا المرض طبيعي عملما قبل أن توقف؟</td>
</tr>
<tr>
<td>4</td>
<td>27. هل ممكن حضرتك تقولي امشي آخر عمل حضرتك اشتهت؟</td>
</tr>
<tr>
<td>5</td>
<td>28. حضرتك كنت بشتوت ايه؟</td>
</tr>
<tr>
<td>6</td>
<td>29. حضرتك كنت بشتوت ايه؟</td>
</tr>
<tr>
<td>7</td>
<td>30. ممكن حضرتك تقولي كان كم متوسط دخلك الشهرى من العمل؟</td>
</tr>
<tr>
<td>8</td>
<td>31. للبحث: لو المشتركة (رجل البيت) حاليا أسال ما يلي: حضرتك فوقى يه لازم نفسه، هل تقولي ايه السبب الرئيسي في إلك ربة البيت؟</td>
</tr>
</tbody>
</table>

### الأسئلة التالية تصل فقط إذا كان المشتركة يعمل فقط:

<table>
<thead>
<tr>
<th>رقم</th>
<th>شرح</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32. فأقرأ على حضرتك مجموعة من الجمل التي يتوصف شعور حضرتك نحو عملك وعائلتك حضرتك تقول لنا إلى أي مدى حضرتك يتوافق على هذه الجمل.</td>
</tr>
<tr>
<td>2</td>
<td>مع الأخذ في الاعتبار لكل حجة، انا راضي عن شغفي</td>
</tr>
<tr>
<td>3</td>
<td>شغفي يتطلب مجهود بدني</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>رقم</th>
<th>مرافق جدا</th>
<th>مرافق جدا</th>
<th>محايد</th>
<th>مرافق جدا</th>
<th>مرافق جدا</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>-----</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) أنا دائماً تحت ضغط نتيجة لحجم العمل الكبير
(2) أنا معني بشيء في الرتبة التي أقوم بها بعملي
(3) أنا عني بالفرصة لنفهمة مهاراتي
(4) أنا بلا قدرة المساعدة التي يحتاجها معي أمر بمواصفات صعبة
(5) أنا بلا قدرة الاعتراف (التكدير) التي استحقها في شغلي
(6) ماذا أخذ من الاعتبار لكل المحرك الذي يقوم به والإجازات التي يحققها، اعتبار كافي
(7) احتمالات التقدم أو الرتبة في شغلي ضعيفة
(8) التأمينات التي في شغلي كيحة
(9) هل حضرتك ممكن تفكر أن كل للمطاعم ممكن معانش معي?
(10) هل مضحك بنقص أن مصلك ممكن تحدد من قدرتك على العمل قبل ما توصل لمن المعانش؟
Appendix

Part 2: The Egyptian validated version of the MoCA test used in the study
Appendix C
Consent Form

الجامعة الأمريكية بالقاهرة

استمارة موافقة مسبقة للمشاركة في دراسة بحثية

عنوان البحث: دراسة العلاقة بين الوضع الاجتماعي والاقتصادي والوظائف المعرفية لكبار السن في مصر

الباحثين: ماسي ماهر

البريد الإلكتروني: MacyMaher@aucegypt.edu

رقم الهاتف: 01221912880

انت مدعو للمشاركة في دراسة بحثية عن تقييم العلاقة بين الوضع الاجتماعي والاقتصادي والوظائف المعرفية لكبار السن في مصر.

هدف الدراسة هو معرفة العلاقة بين الأحوال الاقتصادية والاجتماعية ومستوى المعرفة عند كبار السن في مصر. تسعى الدراسة للتعرف على إذا كانت العوامل المختلفة قد تؤثر على صحة كبار السن. في النهاية، سوف تقدم مقترحات بناءً على النتائج البحثية التي تهدف إلى المصلحة الفردية لصحة كبار السن في مصر.

نتائج البحث ستنتشر في دورية متخصصة أو مؤتمر علمي أو ربما كليهما.

المرجع المتوقعة للمشاركة في هذا البحث (0-5 دقايق)

إجراءات الدراسة: هذا البحث سوف يقام تحت إشراف مختصين. سوف تتطلب المشاركة وجود المشاركين وهمًا لوجه مع الباحث في جامعات أو هياكل مختلفة بعد موافقة مشرف الدراسة. ستكون المشاركة في هذا الاستبان بتطوعية وكل الإجابات تعتمد على السرية التامة.

المخاطر المتوقعة من المشاركة في هذا البحث: لا يوجد.

الاستفادة المتوقعة من المشاركة في البحث: تقييم المتطوع للحالته الصحية.

السرية واحترام الخصوصية: المعلومات التي ستتبادل بها في هذا البحث سوف تكون سرية وستكون هويتك غير محددة.

77
أي أسئلة متعلقة بهذه الدراسة أو حقوق المشاركين فيها أو عند حدوث أي إصابات ناتجة عن هذه المشاركة يجب أن توجه إلى الباحث الرئيسي ماسي ماهر و رقم الهاتف 12198806.

إن المشاركة في هذه الدراسة ما هي إلا عمل تطوعي. حيث أن الامتناع عن المشاركة لا يتضمن أي عقوبات أو فقدان أي مزايا تحقق لك. ويمكنك أيضا التوقف عن المشاركة في أي وقت من دون عقاب أو فقدان لهذه المزايا.

الموافقة المستنيرة
يرجى وضع علامة اختيار على المربي.

☐ أوافق

☐ لا أوافق
Appendix D

IRB case approval letter

THE AMERICAN UNIVERSITY IN CAIRO
Institutional Review Board

Casc# 2022-2023-052

Macy Abou Gabal

Please note that IRB approval does not automatically ensure approval by CAPMAS, an Egyptian government agency responsible for approving some types of off-campus research. CAPMAS issues are handled at AUC by the office of the University Counsellor. The IRB is not in a position to offer any opinion on CAPMAS issues, and takes no responsibility for obtaining CAPMAS approval.

This approval is valid for only one year. In case you have not finished data collection within a year, you need to apply for an extension.