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A Mixed Method Review of Cognitive Decline in the Older Incarcerated Adult Population

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ABSTRACT

The percentage of older adults incarcerated in prisons is rapidly increasing. As this population ages, they experience normative age-related declines in health, including declines in cognitive functioning. Incarcerated older adults are especially vulnerable to diagnosis of mild cognitive impairment, as well as Alzheimer's disease and related dementias (ADRD). These diagnoses are in part due to accelerated aging from stresses of incarceration, longer prison sentences, and lifestyle or behavioral choices before becoming incarcerated. This mixed method review serves to uncover the biological and behavioral underpinnings of cognitive decline in this older adult incarcerated population. A comprehensive search of the body of literature was conducted using the databases PubMed, CINAHL, and Web of Science. After reviewing multiple articles, 21 relevant studies were included for analysis and discussion. The selected articles present findings from US-based and international studies conducted between 1985 and January 2022. Analysis and evaluation of the articles revealed four key sets of thematic findings related to cognitive decline in older incarcerated adults: (1) an assessment of cognitive decline screening measures and tools utilized; (2) evidence of cognitive decline; (3) risk factors associated with cognitive decline; and (4) existing education and programming focused on cognitive decline within this population. The findings from this mixed methods review can inform future research that focuses on the development and testing of interventions to enhance care and management of older adults living in prison with cognitive impairment. Findings may also support policies that promote humane management of this especially vulnerable segment of the incarcerated population.

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"Continue to remember those in prison as if you were together
with them in prison, and those mistreated as if you yourselves were suffering."

Hebrews 13:3

Chapter 1

Introduction

Significance of Problem

The most recent data collected in 2020 reveals that 1.8 million people are currently incarcerated in jails and prisons throughout the United States (US) (Kang-Brown et al., 2021). Of those incarcerated in federal prisons, 16.5% are sentenced to serving 20 years or more (Carson, 2019). The US has the highest incarceration rate of any country in the world – with over 2 million American people expected to be incarcerated at any given time (Prison Policy Initiative, n.d.). Incarceration rates have steadily increased in the US since the mid-1970s due to the passage of federal laws that enacted mandatory minimum sentences, three-strike laws, and parole restrictions. Laws like these have led to an increasing number of individuals aging within the prison system. In addition, factors such as the aging of the birth cohorts born between 1946-1964, which became known colloquially as the "baby boom" generation, as well as medical and behavioral advances that enhance longevity, contribute to the steep increase in older people living in prisons.

Specifically, the number of elderly people incarcerated in the US increased by 181% from 2000 to 2010; and the Bureau of Justice Statistics reports that 200,000 people aged 55 years or older were incarcerated in 2017 (Bronson, 2019; Skarupski, 2018). This trend of aging in the prison system reflects that of the free world, with the US currently experiencing a "silver tsunami" as 20% of the US population is expected to be 65 years or older by 2030 (Anderson et

al., 2012). This rapidly aging society has placed pressure on policymakers and gained relevance within public health conversations as determinations are made as to how to increase quality of life for these aging individuals in the free world. Unfortunately, this same level of attention has not been given to those aging in correctional settings. This thesis will synthesize literature focused on cognitive impairment in the older prison population and suggest implications for intervention in providing care for this population.

Aging in Prison

The definition of "old age" is important to consider in discussions regarding incarcerated adults. Most Western cultures define "old age" as 65 years or older (Singh & Bajorek, 2014). The United Nations defines an individual as "aging" once they reach 60 years old. However, this definition shifts within correctional settings. Although there is no universally accepted age definition for this population, the National Institute of Corrections states that people who are incarcerated are deemed elderly when they reach between 50 – 55 years of age (Human Rights Watch, 2012). Men and women residing within a correctional setting typically experience premature physiological decline and experience many physical and mental health conditions normally only associated with community-dwellers aged 60-65 (Williams et al., 2012). Due to earlier aging, the health of these individuals is frequently compromised. Older adults experience higher rates of functional impairment, multiple comorbidities, and cognitive impairment than younger individuals. Research shows that 40% of elderly people in prison report a diagnosis of cognitive impairment (Williams et al., 2012). This prevalence rate far exceeds that of community-dwelling older adults of the same age (Williams et al., 2012).

Multiple reasons are hypothesized as to why people who are incarcerated experience this more rapid aging. Williams and Abraldes (2007) suggest that this accelerated aging is due to the high disease burden apparent in people of low socioeconomic status who comprise most of the prison population, as well as unhealthy lifestyles and behaviors engaged in prior to incarceration, which include past drug and alcohol abuse, professional sex work, and a lack of primary medical care. These factors are exacerbated by prison environments, settings in which violence, anxiety, and social isolation are common; and the lives of those who are incarcerated are often marked by a sense of purposelessness and hopelessness. As noted earlier, it is typical for 50-year-old incarcerated adults to be classified as "older" or "elderly," and thus this terminology and its definition will be used for the remainder of this report.

Cognitive Decline

Due to this earlier physiological aging of people living in prison, this group of people are more susceptible to developing diseases of aging. Along with consequences of normative age-related cognitive decline, common diseases of aging include physical and mental maladies, as well as mild cognitive impairments and Alzheimer's disease and related dementias (ADRD). These categories of cognitive decline will be the focus of this thesis. Mild cognitive impairment (MCI) is an early stage of memory or cognition loss that is indictive of a future Alzheimer's disease or dementia diagnosis (Mayo Foundation for Medical Education and Research, 2020). Alzheimer's disease (AD) is a progressive memory loss disease that is caused by the abnormal build-up of beta-amyloid and tau plaques around brain cells. Dementia is a gradual, persistent, and progressive disease that is characterized by cognitive decline that

interferes with functionality (Duong et al., 2017). People suffering from dementia struggle with irreversible memory loss that threatens their functional abilities, health, and identity. In the literature, Alzheimer's disease and dementias are compiled into the all-encompassing phrase Alzheimer's disease and related dementias (ADRD); therefore, this phrase will be used throughout this thesis. The physiological, pathological, and biological underpinnings of these diseases will be explored more in-depth in the Background portion of this thesis.

Purpose

The goal of this comprehensive mixed methods review is to identify, evaluate and summarize the most salient quantitative and qualitative studies that explore cognitive decline within the incarcerated older adult community to reveal gaps in the literature and concisely compile a full interpretation of the results to inform future research and shape potential interventions. This research was guided by issues surrounding the biological and behavioral aspects of cognitive decline in prisons, as well as the link between depression and dementia, and provides implications for further research. The specific directing issues that were explored are fleshed out and categorized in the remaining sections of this review.

Table 1: Definitions

ADL	Activities of Daily Living; including bathing, grooming, dressing, walking, toileting, eating, ambulation
Alzheimer's Disease	Neurodegenerative brain disorder that slowly destroys memory and thinking skills and eventually hinders ability to accomplish everyday tasks (NIH, 2021)
Cognitive Impairment	When a person has trouble remembering, learning new things, making decisions, and concentrating (CDC, 2011)
Dementia	General term used to describe impaired ability to remember, think, or make decisions; interferes with everyday life (CDC, 2011)
Forensic Psychiatry	Branch of psychiatry that focuses on the assessment and treatment of people in prisons and secure hospitals (NHS, n.d.)
Incarceration	The state of being confined in a jail or a prison (Dictionary.com, n.d.)
Mild Cognitive Impairment	The stage between the natural, expected cognitive decline associated with aging and the more serious decline of dementia; characterized by problems with memory, thinking, judgement, and language (Mayo Clinic, 2021)
Neurocognitive Disorders	Characterized by a decline in previous level of cognitive functioning; include Alzheimer's disease, cerebrovascular disease, Lewy body disease, frontotemporal degeneration (Sachdev et al., 2014)
Older Incarcerated Person	The determined, uniform reference point for correctional agencies nationwide adopts age 50 as the beginning of the chronological definition of "old age" due to the lifestyles, socioeconomic status and access to medical care experienced by the majority of older offenders (Morton, 1992)
Organic Mental Syndrome	Previously used term to categorize symptoms such as confusion, memory loss, loss of brain function and agitation; currently known as neurocognitive disorders and include diseases such as Alzheimer's disease and dementias (Logsdon, 2020)
Probationer	Person convicted of a crime, who has received a court imposed criminal sentence that releases them to the community under strict regulations instead of confinement to a prison or jail. (Legal Information Institute, n.d.)
Social Capitol	The interpersonal relationships and social assets of a society or group that can be advantageous (Dictionary.com, n.d.)

Summary

The US justice system is experiencing a steady and rapid increase in aging incarcerated adults, with over 200,000 imprisoned individuals currently over the age of 55. Natural

consequences of aging like cognitive decline, and more pathologic, degenerative diseases like dementia and AD, are common among older adults who are imprisoned; however, specialized care for incarcerated individuals experiencing these impairments is limited. This thesis serves to uncover biological and behavioral reasons for cognitive decline and succinctly review the current research in the field to establish the state of the science on this important topic and provide a foundation for future research and public health interventions.

Chapter 2

Background

To understand the literature analyzed later in this report, it is important to gain a holistic understanding of the multiple components affecting cognitive decline in incarcerated older adults. Understanding how these biological, behavioral, and health aspects all intertwine in the lives of older incarcerated adults is essential to the development of effective health interventions and further research efforts. This chapter is organized to explicitly explain these concepts and detail the basics of these biological, behavioral, and health underpinnings that may inform the answering of the directing issues. Due to the complex overlapping nature of the factors, this is not an exhaustive list of potential mechanisms, and further research should be conducted to continue to identify intersections.

Biology

Biological Underpinnings and Pathophysiology of Cognitive Decline

The pathophysiology of Alzheimer's disease and other related dementias is associated with a variety of factors. Biologically, extracellular accumulation of beta amyloid plaques, intracellular neurofibrillary tangles (NFTs), and subsequent inflammation are hallmark signs of the disease and are usually present in the patient's brain to be clinically diagnosed with the disease (Imbimbo et al., 2005). Although this clinical pathology is common in the diagnosis, not all patients experiencing AD have plaques and tangles, and some people with plaques and tangles do not experience AD symptoms. This adds to the complexity of the diagnosis and

treatment of the disease. Along with these biological manifestations of the disease, clinical symptoms of ADRD include progressive memory loss and declining cognitive function. These changes are commonly accompanied by personality shifts, including increased apathy, aggression, and depression (Silva et al., 2019). Each of the pathogenic criteria for diagnosis are discussed further below.

Beta-Amyloid Plaques

Central to the pathology of the disease is the overproduction of beta amyloid plaques which collect between neurons in the brain and disrupt neuronal communication. These plaques form when pieces of the beta-amyloid protein clump and stick together. Specifically, levels of the neurotransmitter acetylcholine are low in brains that are affected by AD. Among many other functions, acetylcholine is a neurotransmitter that plays a role in memory production, consolidation, and retrieval. When the neurons are interrupted by the amyloid plaques, the cells begin to die and the brain experiences abnormal shrinkage of the affected regions. Usually, the first areas of the brain affected by atrophy are regions associated with memory, including the hippocampus and entorhinal cortex (US Health and Human Services, n.d.). As the disease progresses, other parts of the brain involved in language, reasoning, and social behavior located in the cerebral cortex are also affected. The degeneration of these brain regions is what produces the characteristic memory loss symptoms of the disease.

Neurofibrillary Tangles (NFT)

Coupled with the development of beta amyloid plaques, neurofibrillary tangles are also key components in the development of ADRD. Neurofibrillary tangles are the accumulation of abnormal, misfolding tau proteins. They fall under the category of tauopathies, which are defined as the deposition of abnormal tau protein in the brain and are featured in other neurodegenerative diseases (Youssef, 2018). Tau protein helps form microtubules, which are structures in the brain that transport nutrients within nerve cells. In AD brains, the tau proteins detach from microtubules and stick to other tau proteins, eventually forming the threads and characteristic tangles. The tangles develop and continue to intrude on neuronal synaptic communication (Sandoiu, 2019).

Inflammation

The development of these beta amyloid plaques and NFTs trigger the activation of the body's immune system cells to the brain, which subsequently causes inflammation because of the buildup of glial cells, which normally serve to clear the brain of debris. A specific type of glial cell—the microglia—serve to engulf, destroy, and clear waste and toxins in the brain. In AD brains, these microglia are overactivated by the immune system and are unable to clear away the waste, including the beta amyloid plaques and NFTs (US Health and Human Services, n.d.). These cells also release chemicals that cause further inflammation and neuronal damage.

The Link Between Depression and Dementia

In the US, around 13% of the community-dwelling adult population over 65 years old experience some degree of pathological dementia. This rate is expected to increase as the population ages (Maschi et al., 2011). In the older adult prison population, there is no consensus on the exact rates of dementia; however, review studies estimate the range of dementia rates to be between 1% to 44% of the population (Maschi et al., 2011). Wilson and Barboza (2010) predict that by 2050, the number of incarcerated individuals with dementia will triple, with rates expected to reveal that over 300,000 incarcerated persons will be experiencing dementia. This trend aligns with the trend we see in the free world, as rates of dementia naturally increase as the population ages. The Alzheimer's Association reports that currently over 6 million individuals in the free world live with AD and predicts that more than double that number (13 million) will be diagnosed by 2050 (Alzheimer's Disease Facts and Figures, 2021).

Depression is a common mental illness that affects 1 out of 5 free world individuals at some point in their lives, and rates of mental illness in older prisoners is estimated to exceed 80% (Fazel et al., 2001). In a systematic review by Solares and colleagues (2020), older people who are incarcerated showed a 2.2 higher relative risk of depression than the comparison non-offender older adult group. Depressive symptoms earlier in life have shown to lead to a two-fold greater increased risk in dementia development later in life, and researchers have determined multiple underlying biological mechanisms responsible for this correlation (Byers & Yaffe, 2011).

Vascular Disease

Vascular disease provides the strongest evidence for the link between depression and dementia, based on the "vascular depression hypothesis" postulated by researchers in 1997 (Alexopoulos, 1997). This hypothesis states that cerebrovascular diseases exacerbate geriatric depressive syndromes (Alexopoulos, 1997). Depression and vascular disease are bidirectionally related, with depression leading to the development of vascular disease through various behavioral factors, dysregulation of the HPA axis, and elevated cortisol due to metabolic syndrome. The hypothalamic-pituitary-adrenal (HPA) axis is a pathway that plays a key role in the bodies' stress response. It produces cortisol, the body's main stress hormone (Guy- Evans, 2021). Vascular disease promotes the risk of depression, with rates of depression increased after experiencing a myocardial infarction or stroke (Butters et al., 2008). Following the "vascular depression hypothesis," the "vascular-depression-dementia hypothesis" was developed due to the consequences of vascular disease also contributing to dementia symptoms. Ischemic damage to the brain caused by vascular disease leads to cognitive and executive functioning deficits commonplace in dementia diagnoses (Flicker, 2008).

Cortisol Hippocampal Pathway

Another leading hypothesis underlying the depression and dementia link is evidenced in the cortisol hippocampal pathway. In the brain, depression activates the HPA axis which subsequently increases the production of glucocorticoids. These glucocorticoids lead to atrophy and damage of the hippocampus, which as mentioned previously, is a key brain structure in the development of memories. The increased glucocorticoids also disrupt the negative feedback loop

back to the HPA axis, resulting in chronic increased levels of glucocorticoids. It is this disruption of glucocorticoid metabolism that is seen in patients with depression and those with dementia (Byers & Yaffe, 2011). The atrophy of the hippocampus is also a hallmark consequence of both depression and dementia.

Amyloid Plaque Formation

As stated previously, beta amyloid plaque formation is a key diagnostic criterion in AD brains. Studies have revealed that there are higher numbers of plaques in the brains of patients experiencing dementia and depression compared to brains just diagnosed with dementia (Rapp et al., 2006). This is thought to occur because beta amyloid production is increased by the stress response of depression and the increased presence of glucocorticoids (Caraci et al., 2010). This hypothesis is one of the more controversial and less-understood link between the two diseases; however, there is enough biological evidence to elicit further exploration and determine the strength of the correlation. Overall, these biological factors, theories, and pathways interact with various behavioral and social factors to elicit a strong link between depression and dementia diagnosis.

Behavior

Protective Factors Against the Development of Dementia for People Who are Incarcerated

Multiple factors have been proposed as being protective against the development of dementia later in life. No factor is guaranteed to protect against cognitive decline; however,

engaging in certain activities—such as regular exercise, reading, doing mental puzzles, or socially connecting with others—and altering your lifestyle to be physically and mentally healthier have shown to be associated with a decreased risk in decline. Many factors discussed are easily available within most community-dwelling populations but may be restricted in the correctional environment. This statement explains how the factors can be amended to be utilized in the prison system and protect incarcerated older adults from dementia development.

Social Interaction

Multiple studies have been conducted that show the link between one's social environment and the effect it has on behavior and mental health. Specifically, Wilson and colleagues (2007) conducted a longitudinal study that revealed that adults experiencing loneliness had a higher risk of developing AD compared to non-lonely adults (Wilson et al., 2007). The complete absence of social interaction is also considered a major source of psychosocial stress and contributes to an increased risk of neurological disease. In rodent models, social isolation exacerbates cognitive decline; however, this phenomenon is not yet completely understood in humans (Hsiao et al., 2018).

This connection is important to consider for incarcerated individuals, who experience a severe decrease in social networks once incarcerated. A report from the Prison Policy Initiative reveals that only 31% of people living in state prisons received a personal visit in the past month, and this rate is even lower for older adults (Rabuy & Kopf, 2015). Older incarcerated adults report minimal or no contact with marital partners (67%), children (60%), or grandchildren (77%) in the past three months (Maschi, n.d.). The low rates of visitor interaction mean that the

social needs of people who are incarcerated fall on the responsibility of their similar-situated peers. Intervention programs have capitalized on this understanding, and inmate-to-inmate peer support programs have shown to be effective in mitigating the consequences of cognitive decline. Further interventions should be developed to enhance social interaction among incarcerated individuals.

Cognitive Training

Studies have also shown that being mentally active decreases your risk of cognitive decline and dementia in older age (Andrade & Radhakrishnan, 2009). Within the community-dwelling population, a study was conducted with elderly participants by Ball and colleagues (2002). In the study, the researchers led the participants in tasks that strengthened memory, reasoning, and processing skills. The results from this study revealed significant gains of improvement in the forementioned skills, and the positive findings persisted at the two-year and five-year follow-up periods. The neuropsychological gain from the exercises yielded a 7-14-year protection from dementia onset. However, exercises targeted at memory did not lead to results that were as encouraging; and the researchers concluded that this implies that memory will inevitably show decline or that the exercise was not rigorous enough (Ball et al., 2002).

Specific rates of mental stimulation for incarcerated individuals vary from prison to prison; however, overall involvement with mentally stimulating activities is rare due to the restrictive nature of the prison system (Quandt & Jones, 2021). Cognitive training interventions can be amended to fit within the prison environment—conducted with younger people who are

also incarcerated in attempts to prevent later-life cognitive decline or conducted solely with older adults in prison to slow decline.

Health

Exacerbation of Cognitive Decline due to the Prison Environment

The institution of the prison and carceral system can innately be damaging to the mental health and wellbeing of incarcerated individuals through various mechanisms, including the consequences of removal from greater society, lack of purpose, and the unpredictability, violence, and overcrowding of the environment (Quandt & Jones, 2021). These consequences encompass the prison experience and have been linked to increased rates of mental illness, including major depressive disorder and cognitive decline. This section serves to explore how the prison environment inherently is harmful to the health of people who live there, in turn leading to more negative cognitive outcomes for older incarcerated adults.

Incarceration as acute and chronic stressors

Studies have determined a causal relationship between being incarcerated and poor health outcomes (Massoglia, 2008). The prison environment exposes people who are incarcerated to acute and chronic stressors that compound and cause a persistent stress response. This stress response, proposed by Hans Selye in 1956, leads to wear and tear on the body and subsequent negative health outcomes including increased risk of heart disease, a weakened immune system, and depression (Salleh, 2008). Acute stressors in prison include instances like attacks by other

persons who are also incarcerated; and chronic stressors include the lingering fear of being victimized, which is especially relevant to older adults in prison who are susceptible to predatory abuse (Daquin et al., 2021).

Physical and organizational structure of prison

Along with the daily acute and chronic stressors experienced within the prison environment, the physical and organizational structure of incarceration leads to stress and subsequent negative health outcomes. In the landmark study on prison life, researcher Gresham Sykes in 1958 described the loss of liberty, autonomy, material goods, and security that comes with imprisonment (Sykes, 1958). As noted earlier, the loss of contact with family is socially devastating, and any incarcerated individual may feel a lack of purpose and loss of autonomy. In fact, loss of inmate autonomy is a core tenet within the US justice system; however, lack of autonomy is known to lead to poor mental health outcomes (Quandt & Jones, 2021). Physically, prisons are usually overcrowded, leading to less privacy, inadequate access to medical care, and fewer opportunities to engage in programming or work (Quandt & Jones, 2021). Structurally, prisons were not built to accommodate the differing needs of older individuals, which further restricts autonomy and decreases care. Another tenet of the prison system is focused on being obedient and following orders, which may be especially difficult for older people in prison who are experiencing or diagnosed with cognitive decline. Older adults who are incarcerated may not physically or mentally be able to follow prison rules, which may then lead to further punishment and violence (Haney, 2001).

Social Factors that affect Cognitive Decline within the Incarcerated Population

The formation of individual identities is impacted by a wide array of external and internal factors, including one's gender/sex, racial and ethnic identity, and socioeconomic status. Other factors like family history, culture, geographic location, and sexual orientation also interconnect in the development of identity. This question focuses on gender, race, and socioeconomic status as key factors in the conversation around incarceration and cognitive health outcomes. In review of the data, these factors are disproportionately affected by disparities in the incarcerated population, subsequently leading to differences in the acceleration of the aging process, susceptibility to cognitive decline, and cognition outcomes.

Biological Sex

Within the demographic make-up of the prison population, men represent most of the people incarcerated, with 93% of incarcerated individuals identifying as male. Only 7% of the prison population are female; however, this percent is increasing (Federal Bureau of Prisons, 2022). The disproportionate gender difference is thought to be due to the nature of crimes committed, with men committing more violent crimes leading to longer sentencing. However, rates of women becoming incarcerated are increasing twice as fast as men since 1980. Women are more likely to be incarcerated based on less violent crimes, and tend to carry a history of abuse, trauma or mental health conditions that increase risk of incarceration. These risk factors for incarceration also increase the risk of negative outcomes in prison and are associated with cognitive decline later in life, either directly with abuse as a risk factor for later-life cognitive decline or indirectly via depression (Roberts et al., 2020).

Race and Ethnicity

The racial and ethnic breakdown of the prison population is also important to consider. The most recent (2022) data states that 57.9% of the incarcerated population is white, 38.1% is black, and 4% are either Native American or Asian (Federal Bureau of Prisons, 2022). This make-up is disproportionate to the larger US population, with black people representing only 12% of the total US population, yet 38% of the US prison population. The racial disparity is due to a historical legacy of racial subordination in the US, biased policies, and an inherently biased justice system (Nellis, 2021). Further research should be conducted to determine and counteract these underlying causes of racial disparities.

Regarding cognitive decline, black people report a higher prevalence and incidence of experiencing ADRD compared to whites (Weuve et al., 2019) due to myriad factors including chronic stress, lower educational achievement, and higher rates of physical chronic conditions like cardiovascular disease and hypertension, which all exacerbate cognitive decline later in life (Zahodne et al., 2017).

Socioeconomic Status

Another risk factor for both incarceration and cognitive decline is low socioeconomic status (SES). SES is defined as the social standing of an individual, encompassing one's educational status, level of income, and occupation (American Psychological Association, n.d.). Adults living at or below the poverty line are three times more likely to be arrested. Fifty seven percent of men who are incarcerated and 72% of women who are incarcerated were impoverished prior to prison, despite the overall national poverty rate being 11.8% (Hayes &

Barnhorst, 2020). This interaction between impoverishment and incarceration is colloquially known as the "poverty-to-prison pipeline." Further research should be conducted that seeks to determine the root causes of the relationship. Low SES has been identified as a risk factor for development of dementia, and other factors associated with low SES—including poorer diet, physical inactivity, and disability—exacerbate cognitive decline risk (Fischer et al., 2009).

Summary

Chapter 2 provided foundational background information on the underlying biological, behavioral, and health mechanisms relating to cognitive decline, with a focus on cognitive decline in the incarcerated older adult population. Biologically, hallmark signs of cognitive decline include beta-amyloid plaques and neurofibrillary tangles in the brain, accompanied by subsequent inflammation. The pathology and neurobiology of these ailments were discussed. To protect against cognitive decline, the benefits of behavioral factors such as social interaction and cognitive training were discussed in the community dwelling and incarcerated populations. The health aspects of cognitive decline were then discussed, specifically focusing on incarceration as a source of acute and chronic stress, and how the physical environment of a prison exacerbates cognitive decline. Lastly, various social factors including biological sex, race and ethnicity, and socioeconomic status were analyzed as they relate to incarceration rates and increased susceptibility to cognitive decline. Chapter 3 will provide information regarding the mixed method literature review process, including details about the search terms and strategies, Figure 1: Article Selection Tree, and the informative matrix table highlighting the 21 final articles selected for analysis.

Chapter 3

Methods

In Chapter 2, the background information around the biological, behavioral, and health concepts of cognitive decline in incarcerated older adults was discussed. This section will outline the processes that were conducted to identify the articles utilized in this mixed method review. A mixed method review refers to a combination of multiple review approaches to produce an exhaustive and comprehensive literature search. The analysis of such a review style aims to look at the correlations or gaps in the literature to inform conclusions (Grant & Booth, 2009). This review method was determined as the most appropriate review style after consultation with thesis supervisors and a health science librarian. Other types of potential review styles considered include a critical review, mapping review, scoping review, systematic review, and an umbrella review. The details of these review styles are explained in the Grant and Booth (2009) article. In consultation with the health science librarian and thesis supervisors, we considered the strengths and limitations of each style of review, read distinct types of reviews to gain familiarity with the unique styles, and were guided by the information provided in the Grant and Booth (2009) article. Although each one of these styles of reviews benefits research, a mixed method review was determined to be the best fit for this topic due to the body of research literature that is currently available, the interdisciplinary nature of the topic, and the goal of gaining a holistic understanding.

To examine the literature surrounding cognitive decline in incarcerated older adults, a comprehensive literature search was conducted using multiple online databases, including

PubMed, CINAHL, and Web of Science. PubMed is a widely accessible biomedical literature resource that focuses on clinical literature. CINAHL is the Cumulative Index to Nursing and Allied Health Literature which is a strong source when searching for qualitative evidence and includes articles published in the top nursing journals. Web of Science is an interdisciplinary database that includes high quality journals in each field. These three databases were chosen because of the high caliber of research they provide access to, and the interdisciplinary nature of the topic elicits a broader range of research. These three reliable databases were used to search for all relevant articles pertaining to the cognitive health of incarcerated individuals.

To gather the most articles, a wide array of search terms was developed in consultation with a health science librarian. Through discussion and deliberation, the keywords, synonyms, and medical subject heading (MeSH) terminology for the topics of cognitive decline, incarceration, and older adulthood were compiled. This built the basis for the comprehensive vocabulary used to identify articles. In all three databases, the final search was conducted with the search terms "(cognitive decline OR cognitive impairment OR cognitive disturbances OR mental deterioration OR dementia OR Alzheimer's OR Alzheimer's disease OR AD OR vascular dementia OR cognitive dysfunction OR mild cognitive impairment OR frontotemporal OR memory loss) AND (aged OR older adult OR aging OR elderly OR geriatric) AND (prisoner OR inmate OR offender OR incarcerated OR incarceration OR penal system OR prison OR jail OR criminal OR justice involved)". This ensured that relevant articles would be discovered and considered for analytical review.

In PubMed, the original search yielded 151 results. The title and abstracts of these articles were screened by the author for relevancy, leading to the exclusion of 98 articles. Criteria for relevance included items such as: the target age group of the study being adults 50 years or older,

the outcome of the study focusing on some element of cognitive decline, and the setting of the study occurring in or around a prison environment. Studies that were conducted internationally were included in the review due to limited research conducted in the US in this field. Based on these criteria, 53 articles underwent full examination, and 41 were excluded due to irrelevance. After this process, 12 articles from PubMed were determined to fully meet inclusion criteria and thusly, were abstracted in the matrix table. In CINAHL, the same search terms were used to generate 48 articles. After reviewing titles and abstracts, 29 full text articles were examined, and one article was deemed relevant and included in the review. In the database Web of Science, the search terms yielded a result of 88 potential articles. From this, 46 articles were excluded based on title and abstract review, and 42 underwent full text reading. Thirty-nine of those articles were further excluded due to irrelevance, leading to 3 articles being included in the final matrix table. In conducting these searches, many of the same articles were found on all three databases. Any duplicates that were found and utilized were included as part of the PubMed search, as shown in Figure 1: Article Selection Tree.

Finally, four other articles were included in the matrix review table. These articles were discovered via hand searches with similar search terms conducted in the Google Scholar database and through analysis of citations and references from relevant published articles, otherwise known as an ancestry search. Lastly, one final article was added to the analysis. This article was discovered by a thesis supervisor and passed along for inclusion in the study due to its recent publication date and extremely relevant findings (Stoliker et al., 2022). In Figure 1: Article Selection Tree, all five of these articles are noted as “independent searches.”

In total, 21 relevant articles are included in this review. All the articles were thoroughly reviewed and rated, and all information was extracted based on the Matrix Method described in

the second edition textbook, *Health Sciences Literature Review Made Easy* (Garrard, 2007). To appropriately rate and appraise the strength and quality of each study, the Johns Hopkins Nursing Evidence-Based Practice Evidence Level (see in Appendix A) was utilized (Dang & Dearhold, 2017). This tool allows the study to be evaluated based on level of evidence, rated from Level I to Level V. Level I is the highest level of evidence and Level V is the lowest. Each article was also graded A, B, or C based on quality guides. Grades A and B are given to articles of "high or good quality," whereas Grade C is given to articles of "low quality that exhibit major flaws." All included articles underwent this structured evaluation process, and the determined level and grade are noted in the last column of the matrix table for each respective article.

Figure 1: Article Selection Tree

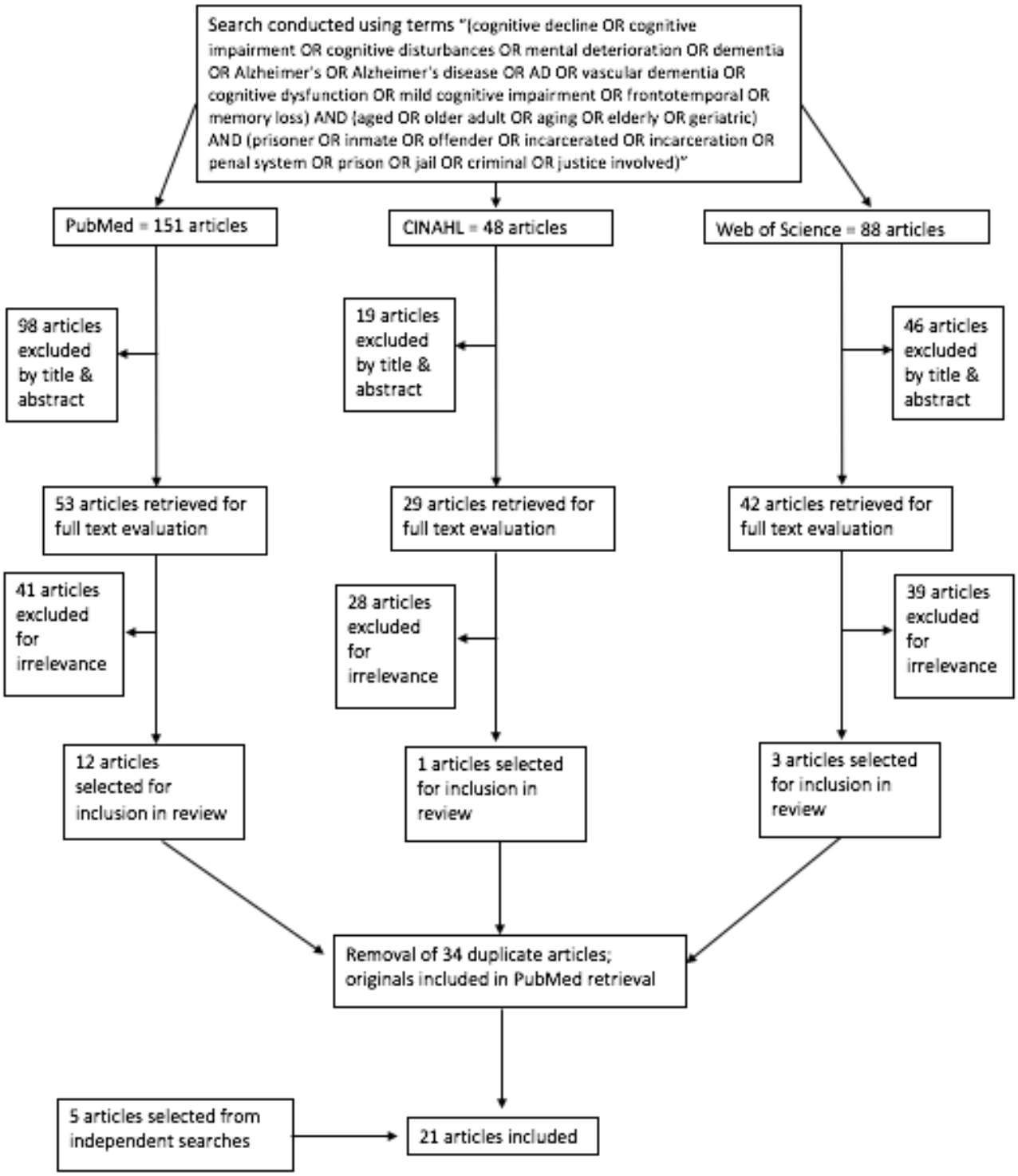


Table 2: Matrix Table

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Rosner, R., Wiederlight, M., &; Schneider, M. (1985). Geriatric felons examined at a forensic psychiatry clinic. *Journal of Forensic Sciences, 30*(3). https://doi.org/10.1520/jfs11007j	- Provide data about geriatric defendants indicted on felony charges including the psychiatric diagnoses of the defendants	- Descriptive	Setting: Forensic Psychiatry Clinic in New York between Jan 1974 – July 1981 Sample: N= 25 - All aged 62 years or older - All indicted on felony charges (22 violent, 3 non-violent)	- Psychiatric disorder criteria determined by DSM- 2	Diagnoses: - Schizophrenia (n=6) - Personality disorders (n=7) - Organic mental syndrome (n=7) - Chronic alcoholism (n=3) - Major affective disorder (n=2) - Acute anxiety (n=1) - Atypical paranoid disorder (n=1)	Strengths: - Considered other factors such as education status, marriage status, previous vocation - Findings specifically relevant to US population Limitations: - Biased sample: not all indicted persons over age 62 are referred for psychiatric evaluation - Limited sample size - All male sample - Sample not representative of geriatric offenders as a whole Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Heinik, J., Kimhi, R., & Hes, J. P. (1994). Dementia and crime: A forensic psychiatry unit study in Israel. *International Journal of Geriatric Psychiatry*, *9*(6), 491–494. https://doi.org/10.1002/gps.930090608	- To compare the assessment aspects of patients with dementia compared with patients with psychosis and patients with personality disorders - To assess competency of patients with dementia to stand legal trial	- Descriptive - Retrospective - Comparative - Chart review	Setting: 1 Forensic Psychiatry Unit in Israel Sample: N= 57 - Higher proportion of male patients - All aged 60+	- Utilization of the ICD-9 to assess prevalence of multiple mental disorders	- Dementia (30%) - Functional psychosis (25%) - Personality disorder (28%) - Patients with dementia should be classified as intermediary between patients with psychosis and patients with personality disorders	Strengths: - Provided recommendations to the court and legal systems - Provided an opportunity for patients with dementia to pass evaluation through the lens of this assessment Limitations: - Small sample size, leading to low statistical power - Nonrandom sampling - Lack of applicability to other countries Level & Grade: IIIC

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Lapornik, R., Lehofer, M., Moser, M., Pump, G., Egner, S., Posch, C., . . . Zapotoczky, H. (1996). Long-term imprisonment leads to cognitive impairment. *Forensic Science International, 82*(2), 121-127. doi:10.1016/0379-0738(96)01985-8	- Effect of long-term imprisonment on overall cognitive decline	- Longitudinal - 2 questionnaire sessions - 42-month intervals	Setting: Austria Sample: - Random sampling - N = 23 - All participants were men aged between 20 and 54 years old, convicted of murder, and incarcerated in Austrian penitentiary	3 German instruments - SKT: measure concentration and memory - MEWOTE-B: general intelligence - FPI: dimensions of personality	- No significant differences found in either personality dimensions or general intelligence between session 1 and session 2 - Significant and positive correlation between duration of incarceration and degree of deterioration in cognitive function (seen in 14 participants)	Strengths: - Correlational trend established aligns with exploration of how prison environment exacerbates mental decline - Controlled for occupation and social contact - Strong reliability of SKT test Limitations: - Limited inclusion of other risk factors for cognitive decline - All male sample - FPI and MEWOTE-B: low reliability compared to SKT test; likelihood of socially desirable answers - Lack of applicability to other countries - Did not control for education and prior mental illness - Mean age of participants = 31.9 years - Range: 20-54 years old - Not specifically geriatric inmates Level & Grade: IIIA

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Fazel, S., Hope, T., O'Donnell, I., & Jacoby, R. (2001). Hidden psychiatric morbidity in elderly prisoners. *British Journal of Psychiatry, 179*(6), 535-539. doi:10.1192/bjp.179.6.535	- To determine the prevalence of psychiatric disorders in male prisoners age 60+	- Qualitative research - Interviewer was blinded to diagnoses recorded in medical notes and to the index offence when administering the instruments - Interviews were conducted in private and were semi-structured, - Conducted between April 1999 and March 2000 - Conducted by a specialized psychiatrist	Setting: 15 prisons in England and Wales (UK) - all prisons included in this study held at least 15 elderly inmates Sample: - Stratified sample - N = 203 - Male - All aged 59+ years old	- GMS: usually used to assess mental state of elderly in community; utilized within the prison setting for the first time within this study - SCID-II: personality disorders	- Psychiatric diagnosis (> 50%) - Depression (29.5%) • Higher than rates found in younger prisoners and community dwelling older adults - Personality disorder (30%) - Consuming some kind of prescribed medication (76.5%) - Dementia (1%) - Rates of dementia in the study are considerably lower than secondary data rates that report high prevalence of dementia in elderly offenders at other stages of the criminal justice system	Strengths: - Considered type of prison, conviction of inmate, ethnicity - High response rate of participants Limitations: - GMS has never been used in a prison setting - All male sample - Sample was biased toward those who have spent shorter amounts of time in custody - Failed to consider other key factors (i.e. substance/ alcohol use, education status) - Lack of applicability to other countries Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Fazel, S., & Grann, M. (2002). Older criminals: A descriptive study of psychiatrically examined offenders in Sweden. *International Journal of Geriatric Psychiatry, 17*(10), 907–913. https://doi.org/ 10.1002/gps.715	- Examine the prevalence of various psychiatric diagnosis among older offenders referred by the court for psychiatric assessment in Sweden compared to younger offenders	- Retrospective, descriptive - Cross- sectional	Setting: Sweden Sample: - Obtained data from Swedish forensic psychiatric assessments from the years 1988-2000 N= 7297 offenders N= 210 aged 60 or older N = 103 aged 65+	- ICD- 9 was used to diagnostically classify from 1988 - DSM-IV was used to diagnostically classify from 1997	Found that in the sample of men and women aged 60+: - Psychotic illness (32%) - Personality disorder (20%) - Substance abuse (15%) - Depression or anxiety (8%) - Dementia (7%) - Reports gathered from multiple documents (e.g. medical records, employment records) - Older offenders more likely to be diagnosed with dementia or affective psychosis	Strengths: - Largest cross-sectional descriptive study on older offenders referred for psychiatric assessment - First study examining legal insanity in older adults Limitations: - Difficult to draw conclusions with cross-sectional data - Age-related cohort effects: fewer foreign-born elderly offenders - Combining measures of ICD-9 and DSM- IV diagnoses: decreases individual validity of each measure - Lack of applicability to other countries Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Williams, B. A., Lindquist, K., Hill, T., Baillargeon, J., Mellow, J., Greifinger, R., & Walter, L. C. (2009). Caregiving behind bars: Correctional officer reports of disability in geriatric prisoners. *Journal of the American Geriatrics Society, 57(7)*, 1286-1292. doi:10.1111/j.15325415.2009.02286.x	- Assess officers' recognition of disability within their assigned prisoners contrasted with actual rates of disability present - Determine how to maximize the role of correctional officers as serving the geriatric and disabled prisoners under their supervision	- Mixed methods design - Cross-sectional data collection - Qualitative questionnaire data	Setting: - 11 prisons in California – with high rates of geriatric inmates Sample: - Random sampling - Face-to-face interviews with correctional officers - N= 71 correctional officers - N = 618 geriatric inmates under supervision	- Correctional officer questionnaires; inclusion of questions from MDS - CDCR data: review of medical chart	- 1/3 of prison officers did not know who their assigned prison inmates were - Officers reported significantly higher rates of disability than reported from CDRC data - Inmates diagnosed with cognitive impairment (n=36) - Only 6 were recognized by officers - ADL impairment (5%) - Deemed unsafe based upon observational understanding of inmate (3.1%)	Strengths: - Random sample - Findings can be utilized in the development of interventions - Inclusion of open-ended questions posted to participants - Led to policy implications: California prison system deemed to have poor quality Limitations: - CDRC does not collect information regarding memory impairment; disability assessment dates were unavailable - Study focused on proxy reports rather than self- reported data to determine disability and geriatric syndromes - Limited generalizability to other states - Race, gender, education status not considered Level & Grade: IIIA

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Kingston, P., Le Mesurier, N., Yorston, G., Wardle, S., & Heath, L. (2011). Psychiatric morbidity in older prisoners: Unrecognized and undertreated. International *Psychogeriatrics, 23*(8), 1354-1360. doi:10.1017/s10416 10211000378	- Determine prevalence of psychiatric disorders within geriatric prisoners in correctional facilities	- Qualitative research via interview - Interviewers were blind to respondent's medical history and criminal data - Private interviews conducted between October 2008 and March 2009 - Interviewers had a background in mental health services	Setting: - 4 correctional facilities around Staffordshire (UK) - Dovegate - Featherstone - Shrewsbury - Stafford Sample: N= 121 - All male	- GMSE: mental health assessment tools for older adults - MMSE: cognitive function in hospital/ community settings - SF-12: measures health-related QOL	- Self report data concluded: - Mental health problems (42.1%) - Diagnosable mental disorder (50%) - Depression (83%) - Cognitive impairment (12%) - Dementia (n=2) - Discrepancies were found between self-report data and medical chart data	Strengths: - Provided information regarding the link between depression and dementia - Reliable findings due to the validity and reliability of the measures used - Used more than one assessment tool to assess the same component (psychiatric disorder) - Reason for incarceration considered Limitations: - Lack of applicability to other countries - All male sample - Low participation rates (51%) - Unreliability of self-report data Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Hayes, A. J., Burns, A., Turnbull, P., &; Shaw, J. J. (2012). The health and social needs of older male prisoners. *International Journal of Geriatric Psychiatry, 27*(11), 1155–1162. https://doi.org/10.1002/gps.3761	- To quantify the health and social needs of older male prisoners in order to determine if their needs were being met by the facilities and staff	- Mixed methods design - Cross – sectional data collection - Data collected by interview and case note review	Setting: 13 prisons in Northwest England Sample: N= 262 - All male prisoners - Ranging in age from 50-70+ years old	- Used SCID-I and SCID-II to test for mental disorder and personality disorder - Used Burvill Grid to assess physical health - Mini Mental State Examination to assess cognitive impairment - Used the CANFOR-S to assess health and social needs; specifically designed for prison populations; completed via interview	- Physical health disorder (90%) - Mental health disorder (61%): most common included major depressive disorder and alcohol misuse disorder - No significant difference in total scores on the MMSE between age groups - Found age 50 to be useful age cut-off	Strengths: - First study to systematically compare the health needs of older groups of prisoners - First time CANFOR-S was used in this age group Limitations: - Possibility of cohort effects - Physical illness assessment conducted via interview - All male sample - Lack of applicability to other countries Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Combalbert, N., Pennequin, V., Ferrand, C., Armand, M., Anselme, M., & Geffray, B. (2017). Cognitive impairment, self-perceived health and quality of life of older prisoners. *Criminal Behaviour and Mental Health, 28*(1), 36–49. https://doi.org/10.1002/cbm.2023	- To examine the cognitive performance of older male prisoners and determine its effect on perceived quality of life and health indicators - To determine the extent of which cognitive performance of older men in prison is similar or different from that of community-dwelling men of similar age	- Descriptive correlational	Setting: 7 French Prisons Sample: - Convenience sampling method N= 138 - All male - All over the age 50 compared to N= 138 males in general community	- MMSE: to assess cognitive functioning - Frontal Battery Assessment (FAB): assess executive functioning - Nottingham Health Profile (French version): assess sleep, energy, social isolation, emotions - WHOQOL-BREF: to assess quality of life	- Cognitive impairment is significantly pronounced in older incarcerated men than men in the community - Perceived QOL was significantly lower in incarcerated men than community dwelling men - 20% of male prisoners had scores on MMSE that suggest dementia and cognitive impairment	Strengths: - Followed all ethical guidelines and principles (informed consent emphasized) Limitations: - All male sample - Subjectivity in responses of participants regarding their mental health: participants were only asked to evaluate their mental health on one day - Non-random sampling - Lack of applicability to other countries Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Ekström, A., Kristiansson, M., & Björkstén, K. S. (2017). Dementia and cognitive disorder identified at a forensic psychiatric examination - a study from Sweden. *BMC Geriatrics, 17*(1). https://doi.org/10.1186/s12877-017-0614-1	- To determine the relationship between dementia and crime through examining diagnosis of dementia or cognitive disorder in forensic psychiatric examination	- Retrospective descriptive	Setting: - Cases selected from Swedish National Board of Forensic Medicine database Sample: N= 17 cases of dementia N= 4 cases of cognitive disorder - 18 men - 3 women	- Physical examination performed by physician - Medical chart review - MRI or CT scan, CBF and EEG tests performed - Mental health data from MMSE	- Few cases of dementia or cognitive disorder identified by forensic psychiatric examinations - Widespread prevalence of alcohol abuse among participants	Strengths: - Inclusion of females in sample - Detailed various causes of dementia Limitations: - Small sample size - Limited generalizability due to lack of applicability to other countries Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Ahalt, C., Stijacic-Cenzer, I., Miller, B. L., Rosen, H. J., Barnes, D. E., & Williams, B. A. (2018). Cognition and incarceration: Cognitive impairment and its associated outcomes in older adults in jail. *Journal of the American Geriatrics Society, 66*(11), 2065-2071. doi:10.1111/jgs.15521	- Determine the prevalence/ outcomes of cognitive impairment in incarcerated older adults	- Combined cohort study - Data from 2 studies - Cross-sectional: conducted May – November 2012 - Longitudinal study: conducted March – June 2015	Setting: - Singular urban county jail (USA) Sample: - N = 310 (total) - N = 125 (longitudinal) - N = 185 (cross-sectional) - Study eligibility: incarcerated for at least 48 hours - English or Cantonese speaking	- Adjusted Montreal Cognitive Assessment (MoCA) - 20 had strong association with dementia diagnosis	- MoCA: - > 25 score (70%) - > 20 score (25%) - Physical health outcomes: - health status as "fair" or "poor" (50%) - mental illness (45%) - multiple morbidity (64%) - functional impairment (51%)	Strengths: - First study to describe factors of positive MoCA score for older adults in jail - MoCA is highly sensitive in detecting MCI prevalence - Inclusion of questions that were asked of participants enhances reliability of study Limitations: - MoCA screen is not diagnostic - Only conducted in 1 jail - Sociodemographic characteristics of sample are not diverse - 95% male - 75% non-White - 85% low SES Level & Grade: IIIA

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Fitton, L., Bates, A., Hayes, A., &; Fazel, S. (2018). Psychiatric Disorders, substance use, and executive functioning in older probationers. *Criminal Behaviour and Mental Health, 28*(6), 447–459. https://doi.org/10.1002/cbm.2094	- To examine the mental health, rates of substance use, and executive functioning of older probationers	- Descriptive study - Demographic and clinical data collected via interviews (age, occupational history, current medications, etc.)	Setting: - Various probation sites within Berkshire, Oxfordshire, and Buckinghamshire, UK Sample: N= 32 - All male - All aged 50 or older	- TOPF: estimates intellectual functioning - D- KEFS: vernal, letter, and category fluency test - Color- word interference test: measured response inhibition - MINI 5.0: assess mental disorders - GDS-15: measures depressive symptoms - AUDIT: assess alcohol abuse - DAST-10: assess problematic drug use - 6 CIT: assess cognitive deficits	- Mental health difficulties (69%) - Depression(25%) - Alcohol/ substance abuse (19%) - Compared to normative general population data, older probationers do not have significant differences in executive functioning	Strengths: - First study to examine mental health of older probationers - Higher percentage of sample were sex offenders; findings may be more relatable to that subset population - All measures used previously in studies with offenders Limitations: - Small sample size - All male sample - Lack of applicability to other countries Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Archuleta, A. J., Prost, S. G., & Golder, S. (2019). The light and dark sides of social capital: Depressive symptoms among incarcerated older adults. *International Journal of Social Psychiatry, 66*(1), 23-33. doi:10.1177/0020764019876670	- Examine themes between cognition, social capital, chronic health conditions, and depression	Qualitative and quantitative research - Self-reported interviews Between Jan- Feb 2019 - Mixed-method study	Setting: - Data from one medium security Kentucky correctional facility Sample: - N= 91 - Face- to- face interviews - All male - Excluded: suicidal, isolated, or secluded prisoners	- 20 item ADL measure captured functional status - Generalized carceral trust: related to satisfaction with social relationships - Modified, 3 question WHO QOL-BREF: satisfaction with social relationships - PHQ-8: measured depressive symptoms	- Significantly higher rates of depression and chronic health conditions than non-incarcerated older adults - Emergence of qualitative themes: • social capital is protective against depression and chronic health conditions • prison as a source of community • importance of quality of relationship • emphasis on trust within carceral network	Strengths: - Neurological connection between depression as a risk factor for dementia - Social capital potentially protective against depression - Inclusion of questions asked in interview increases reliability Limitations: - Unreliability of self-report data - All male sample - Vague definition of "social capital" - Level of chronic condition impairment was not included - Brief interviews - Experiences with social capital only reflect the one prison, and social capital may fluctuate in other prisons: low generalizability Level & Grade: IIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Treacy, S., Haggith, A., Wickramasinghe, N. D., &; Van Bortel, T. (2019). Dementia-friendly prisons: A mixed-methods evaluation of the application of dementia-friendly community principles to two prisons in England. *BMJ Open, 9*(8). https://doi.org /10.1136/bmjopen-2019-030087	- To apply and evaluate the effectiveness of dementia-friendly community principles and the delivery of an educational intervention in prison settings	- Mixed Methods - Pilot study - Utilized process evaluation techniques - 1 year follow-up evaluation period	Setting: - Two prisons in England - Prison A was a facility for sex offenders; 34.2% of population aged 50 or older - Prison B was a local prison with 16.1% of population being 50 or older Sample: N= 50 incarcerated males - 11 incarcerated female participants - 18 prison staff	- Specifically formulated questionnaires developed by a research team based on the Alzheimer's Society DFC (dementia-friendly community) criteria - Semi-structured interviews - Focus group discussion guide	- Delivery of dementia information sessions in both prisons resulted in statistically significant increases in attendees' dementia knowledge - Older people in prison, people living with dementia in prison, & staff working in specialized dementia wings = greatest engagement with dementia material, measured against the Alzheimer's Society Foundation Criteria - Data from interviews and focus group discussion revealed five contextual factors that are barriers or facilitators of dementia-friendly principles: institution and environment, staff, prisoners, prison culture, and external factors	Strengths: - First published study that explores how applicable dementia-friendly community principles are in the carceral setting - One of the only studies to examine the amount of support or management people living with dementia in prison receive - Raised awareness for targeted dementia interventions in prisons - Provision of material they used to measure the program's progress Limitations: - Certain aspects of dementia-friendly community principles (e.g., familial involvement) were not able to be achieved in prison context - Small sample size - Lack of applicability to other countries - High rates of personnel and inmate turnover led to difficulty in conducting quantitative analysis • Only 28 participants in 1 year follow up Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Liljegren, M., Landqvist Waldö, M., Frizell Santillo, A., Ullén, S., Rydbeck, R., Miller, B., & Englund, E. (2019). Association of neuropathologically confirmed f rontotemporal dementia and Alzheimer disease with criminal and socially inappropriate behavior in a Swedish cohort. *JAMA Network Open, 2*(3). https://doi.org/10.1001/jamanetworkopen.2019.0261	- To investigate and compare the prevalence of criminal behavior in Alzheimer's Disease and frontotemporal dementia patient's post-mortem - Determine if there is specific protein pathology identified with criminal behavior in patients with frontotemporal dementia	- Cohort study - Medical record review	Setting: - Department of Genetics and Pathology in Sweden Sample: N= 220 N= 101 decedents with a postmortem diagnosis of AD N = 119 decedents with a postmortem diagnosis of frontotemporal lobar degeneration - 58.2% of sample was female	- Analysis of patient case notes reporting criminally/ socially inappropriate behavior - Data on prevalence of protein pathology (tau, transactive response DNA-binding protein 43) via medical records	- Instances of criminal behavior (29.5%) - Recurrence of criminal behavior: higher in the FTD group (89.0%) than in the AD group - Expression of non-tau pathology increased odds for criminal behavior	Strengths: - Inclusion of females in sample - Long study period (51 years) - Diagnoses of dementia were neuropathologically verified Limitations: - Findings on behavior were based on third party interpretation of behavior - Selection bias: the specialized care center in the study only accepts highly behaviorally disturbed or criminal patients - Did not have access to criminal records, but determined criminal behavior from patient notes reporting instances of criminal and socially inappropriate behavior - Lack of applicability to other countries Level & Grade: IIIA

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Brooke, J., & Jackson, D. (2019). An exploration of the support provided by prison staff, education, health and social care professionals, and prisoners for prisoners with dementia. *The Journal of Forensic Psychiatry &; Psychology, 30*(5), 807–823. https://doi.org/10.1080/14789949.2019.1638959	- To gain understanding of the experiences of prison staff, social care professionals, and prisoners with a social care role (prisoner "buddies") in supporting prisoners with dementia	- Inductive phenomenological design - Qualitative data collected via focus groups	Setting: England Sample: N= 29 - Purposive sampling technique - 26 participants were prison staff, education staff, or social workers - 3 participants were prisoner "buddies"	- No formal measure utilized - Data analyzed following the 6 phases of inductive thematic analysis	Emergence of three themes: - Diversity of education and training in dementia provided to staff and prisoner "buddies" - Diversity within roles of prison staff and "buddies" - Diversity that occurred within the prison regime that affected staff, "buddies", and prisoners with dementia	Strengths: - Findings can be used to shape dementia interventions - Highlights the need for further research and development of interventions Limitations: - Small sample size - All male prison - Lack of applicability to other countries - No provision of questions that were asked in interview/ focus groups Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Forsyth, K., Heathcote, L., Senior, J., Malik, B., Meacock, R … Shaw, J. (2020). Dementia and mild cognitive impairment in prisoners aged over 50 years in England and Wales: A mixed-methods study. *Health Services and Delivery Research, 8*(27), 1–116. https://doi.org/10.3310/hsdr08270	- To establish the current prevalence of dementia and mild cognitive impairment among prison populations	- Mixed-Methods Qualitative - Interview	Setting: - Prisons in Wales and England (10) Sample: N = 869 - 596 = male - 273 = female - Random sampling from women's prisons - Representative sample from adult men's prisons	MoCA - cut off score of 23 points If participant scored positive on MoCA → completed the ACE- III (N= 74) 6- CIT: screening measure for dementia - conducted on smaller sample size of 470 individuals	MoCA: - < 23 score (12%) - >24 score (88%) - Dementia diagnosis via ACE-III (7%) - Dementia diagnosis via ACE-III (7%) - MCI diagnosis via ACE -III (1%) - Dementia and MCI via ACE-III measure (8%) - Dementia prevalence across entire sample = 8.1% (95% CI 6.4% to 10.1%) Dementia prevalence stratified by age: - ≥ 70 years (16.9%, 95% CI 12.1% to 23.1%) - 50–59 years: 6.4% (95% CI 4.3% to 9.2 - 60–69 years (4.0%, 95% CI 2.1% to 7.5%)	Strengths: - Able to estimate there are 1090 older prisoners with suspected MCI or dementia in England and Wales - Data on both male and female prisoners -Robust sample -Included multiple prisons across two countries Limitations: - Estimates based on structured assessments and not clinical diagnosis - 6 – CIT is not considered an effective tool for identifying potential MCI or dementia in this population - Lack of applicability to other countries Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Verhülsdonk, S., Folkerts, A.-K., Höft, B., Supprian, T., Kessler, J., &; Kalbe, E. (2020). Cognitive dysfunction in older prisoners in Germany: A cross-sectional pilot study. *International Journal of Prisoner Health, 17*(2), 111–127. https://doi.org/10.1108/ijph-03-2020-0019	- To collect empirical data on the cognitive state of elderly prisoners - To examine associations between overall cognitive function and various sociodemographic characteristics	- Descriptive correlational - Cross-sectional	Setting: - 5 prisons in North Rhine-Westphalia, Germany Sample Size: N= 58 - Mean age= 65.52 years old - 82.8% male	- MMSE - DemTEct: assess global cognition - PHQ – 9: assess affective state	MMSE: marginal/ impaired cognition scores (36.9%) - DemTEct: cognitive impairment (41.4%) Cognitive functioning deficits (40%) Depressive symptoms (60%) - Significant association between cognitive score and duration of current incarceration (p = .043)	Strengths: - First study to examine topic in German prisons - Consideration of male and female prisoners; realistic sample - Use of multiple neuropsychological instruments Limitations: - Lack of applicability to other countries - Small sample size Level & Grade: IIIB

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Romano, C. A., Ravagnani, L., Convertini, A., Dassisti, L., Fanizza, A. … Grattagliano, I. (2020). The aging process in prison: pathologies and health conditions in old inmates. An epidemiological r esearch in Italy. *La Clinica terapeutica, 171*(4), e340–e345. https://doi.org/ 10.7417/CT.2020.2237	- Analyze the pathologies and health conditions in a sample of elderly inmates in Italy	- Multicentric research - Qualitative data collected via interviews conducted between Sept – Dec 2017	Setting: - 8 penitentiaries: Bari, Taranto, Foggie, Lecce, Brescia, Bergamo, Cremona, and Mantova Sample Size: N = 94 - All participants were 60 years or older - Males = 88 - Females= 6	N/A	- Physical problems were more frequently reported than psychological ones - "Optimal health" (36%) - "Not optimal health" (64%) - Null reports of dementia	Strengths: - Authors provide other literature that explains prevalence rates of dementia within the prison system Limitations: - Information on pathologies was self-reported and not cross-checked on medical records - Unrepresentative sample size - Unclear description of measures utilized - Lack of applicability to other countries Level & Grade: IIIC

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Perez, A., Manning, K. J., Powell, W., &; Barry, L. C. (2021). Cognitive impairment in older incarcerated males: Education and race considerations. *The American Journal of Geriatric Psychiatry, 29*(10), 1062–1073. https://doi.org/10.1016/j.jagp.2021.05.014	- Assess cognitive impairment (defined as global cognition and executive functioning) in older incarcerated males, stratified by race and education status	Cross-sectional study part of Aging INSIDE longitudinal study Letter explaining the study was sent to all eligible men who were incarcerated	Setting: USA Sample: N= 239 men who were incarcerated - Mean age = 56.4 years old	- Standard MoCA assessment: 30-point scale - Score <26 indicates cognitive impairment - Trail Making Test (TMT) assessed executive functioning	- Average MoCA score = 24.12 +/- 3.38 - Cognitive impairment based on MoCA screening (63%) - After stratifying by education and race- - Cognitive impairment (40%), higher rate than in community-dwelling older adults - Impaired executive functioning (16%)	Strengths: - Large sample size - Racially diverse sample • Non-Hispanic white (37.7%) • Non-Hispanic black (41.4%) • Hispanic (20.9%) Limitations: - Less than 30% of eligible all participants (N=1,029) who received recruitment letters indicated interest - All male sample - Low generalizability Level & Grade: IIIA

APA Citation	Purpose	Study Design	Setting and Sample	Measures	Key Findings	Strengths, Limitations, Level & Grade
Stoliker, B. E., Kerodal, A. G., Jewell, L. M., Brown, K., Kent-Wilkinson, A., Peacock, S., O'Connell, M. E., &; Wormith, J. S. (2022). Older people in custody in a forensic psychiatric facility, prevalence of dementia, and community reintegration needs: An exploratory analysis. Health &; Justice, 10(1). https://doi.org/10.1186/s40352-022-00168-8	- Investigate the extent to which a) older individuals screen positive for dementia, b) support staff (i.e., social workers and primary nurses) perceive older individuals who are under their care have dementia, c) whether older individuals require supports for successful community reintegration, d) and whether training is provided to support staff to accommodate those older individuals	- Cross-sectional data collection - Comparative descriptive	Setting: Forensic psychiatry hospital located outside city in Canada Sample: N= 29 older individuals in custody N= 8 social workers N= 12 primary nurses - Older individuals in custody: ages ranged between 46-80 years old - Female (3.4%) - Indigenous status (55.2%)	- The Community Screening Instrument for Dementia (CSI'D'): comprised of: - Cognitive Score: from participant interview - Informant Score: caregiver questionnaire - add the two together to develop Discriminant Score: signifies risk of dementia - modified scoring protocol for the Discriminant Score: utilized for Indigenous participants to mitigate educational/ cultural biases	- Positive on the CSI'D': indicating risk of dementia (45%) (n=13) - Social workers (35%) and primary nurses (25%) suspected that at least 1 individual on their caseload had dementia - Support required for community reintegration for older adults - General lack of training/ education for support staff in caring for older individuals	Strengths: - Culturally sensitive screening measure - Very recent findings - Only study conducted in Canada - Accounted for Indigenous populations Limitations: - Low participant response rate - Modified version of the CSI'D' is not a diagnostic instrument; tool has not been tested for reliability and validity - Survey completed by support staff based off of retrospective self-reports - Lack of applicability to other countries - Limited generalizability due to uniqueness of psychiatric facility Level & Grade: IIIA

Chapter 4

Results

The prior chapters of this thesis have detailed introductory and background information that provide an overview of the role of biological, behavioral, health, and social factors in cognitive decline in the older incarcerated population. The methods of gathering the literature were explained in narrative format, as well as graphically in Figure: 1 Article Selection Tree. The resulting 21 selected articles were then included and analyzed in the matrix table. The purpose of this chapter is to discuss what was learned from the body of literature that was analyzed, including the study design and sample sizes, as well as the category and rigor of the journals that the studies were published in. This chapter describes and synthesizes the demographic information, key themes, discrepancies, and other findings found through the deep analysis of the articles. The overarching goal of this review of the body of literature on cognitive decline in older adults who are incarcerated is to increase understanding of the topic, identify findings that inform future interventions, and determine logical next steps in this area of research.

Demographics of this Body of Literature

Twenty-one articles on cognitive decline in older incarcerated adults were included in this review, all published between 1985 and 2022 (Ahalt et al., 2018; Archuleta et al., 2019; Brooke & Jackson, 2019; Combalbert et al., 2017; Ekström et al., 2017; Fazel & Grann, 2002;

Fazel et al., 2001; Fitton et al., 2018; Forysth et al., 2020; Hayes et al., 2012; Heinik et al., 1994; Kingston et al., 2011; Lapornik et al., 1996; Liljegren et al., 2019; Perez et al., 2021; Romano et al., 2020; Rosner et al., 1985; Stoliker et al., 2022; Traecy et al., 2019; Verhülsdonk et al., 2020; Williams et al., 2009). In this section, demographic information such as the types of studies conducted, the sample size, the biological sex of the study participants, and information on the journals the studies were published in are analyzed. Four study designs were categorized as descriptive (Combalbert et al., 2017; Fitton et al., 2018; Heinik et al., 1994; Rosner et al., 1985). One study utilized a descriptive correlational design (Verhülsdonk et al., 2020) and three used a retrospective descriptive design (Ahalt et al., 2018; Ekström et al., 2017; Liljegren et al., 2019). Five studies gathered data cross-sectionally; however, they differed in their specific study design (Fazel & Grann, 2002; Hayes et al., 2012; Perez et al., 2021; Stoliker et al., 2022; Williams et al., 2009). The study by Fazel and Grann (2002) utilized a retrospective descriptive study design. Two studies used a comparative descriptive study design (Perez et al., 2021; Stoliker et al., 2022). Five incorporated a mixed-methods design (Archuleta et al., 2019; Forysth et al., 2020; Hayes et al., 2012; Treacy et al., 2019; Williams et al., 2009), and one was a longitudinal study (Lapornik et al., 1996). There were four qualitative studies: one study was inductive phenomenological (Brooke & Jackson, 2019) and three studies were based on qualitative interviews (Fazel et al., 2001; Kingston et al., 2011; Romano et al., 2020).

The sample sizes of these studies varied: the largest sample size examined information on 7, 297 individuals (Fazel & Grann, 2002), and the smallest sample included 21 individuals (Ekström et al., 2017). Because the prison experience and cognitive outcomes vary by sex, it was important to look at the biological sex breakdown of participants in each study. Nine studies included only male participants (Archuleta et al., 2019; Combalbert et al., 2017; Fazel et al.,

2001; Fitton et al., 2018; Hayes et al., 2012; Kingston et al., 2011; Lapornik et al., 1996; Perez et al., 2021; Rosner et al., 1985) and ten studies included both male and female participants (Ahalt et al., 2018; Ekström et al., 2017; Fazel & Grann, 2002; Forysth et al., 2020; Heinik et al., 1994; Liljegren et al., 2019; Romano et al., 2020; Stoliker et al., 2022; Treacy et al., 2019; Verhülsdonk et al., 2020). None of the studies examined focused solely on female people who are incarcerated. This reveals the lack of biological sex-specific research conducted in this population and proposes an aspect that future research studies should explore. Two studies included did not disclose the biological sex of their participants (Brooke & Jackson, 2019; Williams et al., 2009).

As detailed in Chapter 3, each of the 21 articles underwent appraisal using the Johns Hopkins Nursing Evidence-Based Practice Evidence Level tool (Dang & Dearhold, 2017). This tool allowed each article to be evaluated and graded based on varying levels of evidence. A score of IIIB indicates that the study is a non-experimental study of good quality. Twelve of the 21 articles (57% of the studies) scored as IIIB level articles (Combalbert et al., 2017; Brooke & Jackson, 2019; Ekström et al., 2017; Fazel & Grann, 2002; Fazel et al., 2001; Fitton et al., 2018; Forysth et al., 2020; Hayes et al., 2012; Kingston et al., 2011; Rosner et al., 1985; Treacy et al., 2019; Verhülsdonk et al., 2020). Five studies scored a IIIA on the scale, which indicates a non-experimental study of high quality (Lapornik et al., 1996; Liljegren et al., 2019; Perez et al., 2021; Stoliker et al., 2022; Williams et al., 2009). Two studies scored IIIC, indicating lower quality non-experimental studies (Heinik et al., 1994; Romano et al., 2020). The study conducted by Archuleta and colleagues (2019) was the only study that scored as a level IIB study, indicating it is a quasi-experimental study of good quality (Archuleta et al., 2019).

The research also spanned nine countries. Seven studies were conducted in the United Kingdom (Brooke & Jackson, 2019; Fazel et al., 2001; Fitton et al., 2018; Forysth et al., 2020; Hayes et al., 2012; Kingston et al., 2011; Treacy et al., 2019), five studies in the US (Ahalt et al., 2018; Archuleta et al., 2019; Perez et al., 2021; Rosner et al., 1985; Williams et al., 2009), three studies in Sweden (Ekström et al., 2017; Fazel & Grann, 2002; Liljegren et al., 2019), and one each in Israel (Heinik et al., 1994), Austria (Lapornik et al., 1996), France (Combalbert et al., 2017), Germany (Verhülsdonk et al., 2020), Italy (Romano et al., 2020), and Canada (Stoliker et al, 2022). Challenges related to demographic shifts toward an older prison population and the related need to humanely manage and care for older incarcerated people with dementia are global problems. Global research attention to this topic is important in shaping overall understanding and pointing to next steps in this area of science.

As explained in Chapter 3, the specific articles were obtained for this review via searches in three scientific databases (PubMed, CINAHL, and Web of Science). These databases compile studies originally published in various multidisciplinary peer-reviewed scientific journals. The types of journals these articles were published in revealed a trend in the research. Earlier studies were published largely in psychiatry or forensic science journals. At the time, research on cognition outcomes was widely considered as psychiatric research, and any research with incarcerated individuals was assumed to be categorized as forensic science. However, as the research has evolved, more recent studies have been published in clinical journals, including journals specifically regarding aging or the intersection between mental health and criminal behavior. In this review, seven out of the 21 articles were published in journals pertaining to psychiatry – either specifically regarding geriatric psychiatry or within the broader field of general psychiatry. The geriatric focused psychiatry journals included the *International Journal*

of Geriatric Psychiatry (Fazel & Grann, 2002; Hayes et al., 2012; Heinik et al., 1994), the *American Journal of Geriatric Psychiatry* (Perez et al., 2021), and the *International Psychogeriatrics* (Kingston et al., 2011), whereas other articles were found in general psychiatry journals like the *International Journal of Social Psychiatry* (Archuleta et al., 2019) or the *British Journal of Psychiatry* (Fazel et al., 2011). Three articles were found in journals pertaining to forensic science (Brooke & Jackson, 2019; Lapornik et al., 1996; Rosner et al., 1985). The Rosner and colleagues' study (1985) was published in *The Journal of Forensic Sciences*, the Lapornik and colleagues' study (1996) was published in *Forensic Sciences International*, and the Brooke and Jackson study (2019) was published in *The Journal of Forensic Psychiatry and Psychology.* Forensic science is a field that applies scientific thinking and methodology to criminal laws, and so aligns with the focus area of this thesis. The most recent article by Stoliker and colleagues (2022) was published in *Health and Justice*, which publishes research on the health and wellbeing of people involved in the justice system.

Two articles were published in *The American Journal of Geriatrics Society*, also known as JAGS (Ahalt et al., 2018; Williams et al., 2009). This journal is the gold-standard journal for clinical aging research and the leading authors of the two papers published in JAGS, Brie Williams and Cyrus Ahalt, are both key researchers and leaders in the field of aging and health in prisons affiliated with the Aging Research in Criminal Justice Health (ARCH) network at the University of California, San Francisco. Two articles (Combalbert et al., 2017; Fitton et al., 2018) were published in the esteemed UK journal *Criminal Behavior and Mental Health*. This journal publishes any original work regarding the intersection of mental states and criminal behavior. The other six articles were found in journals that focused more broadly on any aspect of the health of older adults, the delivery of healthcare, or general health and medicine. Due to

the large number of studies being conducted internationally, most of the journals are also international in scope, including the Italian journal *La Clinica Terapeutica.* Upon review of each journal, the strength of the journal was identified in the table below (Table 3: Impact Factors). Impact factors are used as a proxy for journal importance because an impact factor (IF) is a calculated measure of the yearly frequency with which articles from that journal are cited. The IF of each journal is included in the table to assess the importance and rank of the journals. The year the journal was established is also included in the Impact Factor table, because it is important to keep in context when considering the impact factor score. There are inherent limitations of impact factors. Journals of longer duration will receive higher scores because IFs are determined based on number of citations. For those reasons, newer journals may not have an IF score; however, that does not mean they are unimportant. Journals that publish review articles may also receive higher IF scores due to the likelihood that those articles are cited more frequently over time (Sharma et al., 2014). See the following page for the Impact Factors table.

Table 3: Impact Factors

Journal Title	Year Established	Impact Factor
American Journal of Geriatric Psychiatry	1993	3.48
BMC Geriatrics	1875	3.73
BMJ Open	1840	2.69
British Journal of Psychiatry	1853	7.23
Criminal Behavior and Mental Health	1991	1.57
Forensic Sciences International	1978	1.99
Health Sciences and Social Care Delivery Research	1960	3.40
Health and Justice	2016	2.11
International Journal of Geriatric Psychiatry	1986	2.41
International Journal of Prisoner Health	2006	1.00
International Journal of Social Psychiatry	1954	1.61
International Psychogeriatrics	1989	3.87
Journal of the American Medical Association	1883	56.27
Journal of the American Geriatrics Society	1953	5.56
Journal of Forensic Psychiatry and Psychology	1990	0.94
Journal of Forensic Sciences	1956	1.16
La Clinica Terapeutica	1958	2.28

Identification of Key Themes

Four key themes emerged based on analysis of the 21 articles. These include: (1) an assessment of the diverse measures and tools utilized in the studies; (2) evidence of cognitive decline; (3) risk factors associated with cognitive decline; and (4) existing education and programming surrounding cognitive decline within this population. Each of the four themes is described in detail in the following subsections.

Assessment of Measures and Tools

Through examination of all 21 articles, 10 different tools specifically emerged as being salient to research focused on cognitive decline. The Table of Measures in Appendix B identifies the distinct types of tools used. This section seeks to describe the tools and analyze similarities and differences in their utilization. For example, one set of articles sought to determine prevalence of various psychiatric disorders. In the earliest article by Rosner and colleagues (1985), the DSM-2 was utilized to identify psychiatric disorders among participants. The DSM contains descriptions, symptoms, and basic criteria for diagnosing mental disorders. Given the time this study was conducted (1985), the DSM-2 would have been the most updated version of the publication and would have been standard among researchers and physicians in the process of diagnosing patients. Two articles utilized a complement to the DSM, the SCID-I or SCID-II (Fazel et al., 2001; Hayes et al., 2012). The SCID is a semi-structured interview conducted in determining DSM Axis I disorders, which include some of the most common disorders the public experiences, like anxiety and depression (Columbia University Department of Psychiatry, 2018). Both studies that utilized this measure were conducted in the United Kingdom, and both sought to determine the prevalence of psychiatric morbidity and personality disorders within the prison population as well as their subsequent health needs due to diagnosis. Two articles utilized the ICD – 9 (Fazel & Grann, 2002; Heinik et al., 1994) in determining psychiatric diagnosis in incarcerated individuals. The ICD – 9 is the international classification of diseases which includes an alphabetical list and classification system for surgical, diagnostic, and therapeutic procedures (CDC, 2021). This measure is understood internationally, which is why these studies chose this measure, as one was conducted in Sweden and the other in Israel.

Eight of the 20 studies focused on determining underlying factors associated with cognitive decline. The researchers in these studies used different measures to gather their data. For example, Archuleta and colleagues (2019) and Verhülsdonk and colleagues (2020) used the PHQ- 8 and PHQ-9, respectively. The PHQ is a self-administered patient health questionnaire that measures depressive symptoms that can then be applied to diagnosis through the DSM criteria. It is commonly used to determine depressive symptoms in medical settings (Kroenke et al., 2001). As noted previously in this thesis, depressive symptomology has been linked to cognitive decline.

Other studies sought to specifically examine cognitive health. The measure most used across these studies was the Mini-Mental State Examination (MMSE). The MMSE is a set of 30 questions that assess short- and long-term memory, attention span, concentration, and other facets of cognition. It was used to measure levels of cognitive impairment in five studies (Combalbert et al., 2017; Ekström et al., 2017; Hayes et al., 2012; Kingston et al., 2011; Verhülsdonk et al., 2020). The study by Lapornik and colleagues (1996) conducted in Germany utilized the German SKT instrument, which is comparable to the MMSE. The maximum score on the MMSE is 30, which indicates no cognitive impairment. A score between 21 and 24 indicates mild cognitive impairment, a score between 10 and 20 moderate cognitive impairment, and severe impairment is classified as a score of less than 10 (Folstein et al., 1975). This scoring system was standard in each study. Another common tool used to identify cognitive impairment in participants was the Montreal Cognitive Assessment (MoCA). This tool was used in three studies (Ahalt et al., 2018; Forysth et al., 2020; Perez et al., 2021). It is a brief, 10-minute screening tool which assesses various cognitive domains including attention, concentration, executive function, and memory (Julayanont & Nasreddine, 2017). It is important to emphasize

that this tool is a screening tool and does not provide diagnostic information. The MoCA is normally scored on a 30-point scale; however, the studies that used the MoCA adjusted the scoring system to fit the parameters of their own study. Another tool that was utilized was The Community Screening Instrument for Dementia (CSI'D') in the Stoliker and colleagues' (2022) study. This tool is a highly validated screening tool that assesses dementia risk and determines if further clinical assessment is needed (Hall et al., 1993). The final tool specifically seeking to identify cognition outcomes is the 6-CIT test. This six-item cognitive impairment test was used by two studies (Fitton et al., 2018; Forysth et al., 2020). This test is simple and only involves three items: the ability to count backwards from 20, state the months of the year in reverse, and learn an address. The 6-CIT correlates highly with the MMSE and has been shown to be successful in detecting mild dementia in clinical settings (Brooke & Bullock, 1999).

Five of the 21 articles did not explicitly describe an established measure or tool in their collection of data. Three studies (Brooke & Jackson, 2019; Treacy et al., 2019; Williams et al., 2009) sought to determine the effectiveness of education and programming efforts and utilized interviews to gather the desired qualitative data. The study by Liljegren and colleagues (2019) was unique because it used medical records to gather information due to their data collection from post-mortem participants. Romano and colleagues (2020) also did not specifically disclose a type of tool utilized in their aim of determining overall health status of their participants. Overall, as research expanded on this topic, various measures were used by researchers to gather evidence of cognitive decline or underlying factors of cognitive decline. The rigor, validity, and reliability of the various tools increased as the research continued. The collected data is explored in the following sections.

Evidence of Cognitive Decline

Across the articles, the main theme that emerged regarding the results and findings of the studies, regardless of the measures utilized, was the evidence for cognitive decline within the older adult incarcerated population. Determining and discussing the prevalence of cognitive impairment and dementia within this population is necessary to shape future interventions and gain clinical awareness. Most of the analyzed studies reported evidence of cognitive impairment within their sample based on the data collection and measures utilized. Five studies (Ahalt et al., 2018; Forysth et al., 2020; Perez et al., 2021; Stoliker et al., 2022; Verhülsdonk et al., 2020) were key in providing data that suggests higher rates of cognitive impairment in their samples compared to what is found in community settings. These studies were all conducted within the past 5 years, which suggests that research is current, reliable tools are available, and rates of dementia in incarcerated populations have increased. Using the MoCA assessment, Ahalt and colleagues (2018) determined that 25% of their sample had a high association for dementia diagnosis. Forsyth and colleagues (2020) stratified their sample of incarcerated adults by age, revealing that in individuals over 70 years old, the dementia prevalence was 16.9%. In individuals aged 50-59 years old, the dementia prevalence was 6.4%, and in participants aged between 60-69 years of age, the prevalence was 4.0%. For older prisoners aged 60-69, the dementia prevalence rate is two times higher than community-dwelling adults, and for prisoners aged 70 or older, the rate is four times higher than those living in the community (Forsyth et al., 2020). The findings from the most recent study (Stoliker et al., 2022) reported that 43% of their older individuals in custody screened positive for dementia on the CSI'D' tool. The study by Verhülsdonk and colleagues (2020) reported that on the MMSE, 36.9% of their participants indicated impaired cognition. Following that measure, another measure not explored in this

report (the DemTECt) indicated that 41.4% of the sample had cognitive impairment. Perez and colleagues (2021) utilized the MoCA assessment and reported that 63% of their sample met the criteria for cognitive impairment. This rate, as well as most rates found in the other studies, is significantly higher than what is present in community-dwelling older adults, which is 13% of that population (Maschi et al., 2011).

Other studies reported data that revealed only slight evidence of cognitive decline in their sample. The studies that revealed this were all conducted over 10 years ago. Older research may not have utilized reliable testing measures or considered other risk factors, which allows for a high probability of underrepresented cases. It is also possible that rates of dementia were naturally lower over 10 years ago. Rosner and colleagues (1985) only reported seven participants had organic mental syndrome. Organic mental syndrome is the outdated term for cognitive impairment. Fazel and colleagues (2001) reported a low dementia rate of only 1% of their 203-person sample. In a later study, Fazel and Grann (2002) continued to report a low dementia prevalence of only 7% in their large sample size of over 7,000 incarcerated adults. One of these studies was conducted in the UK and the other in Sweden. The health status of the countries these were conducted in may provide insight into why low dementia rates were reported. Kingston and colleagues (2011) reported that only 2 participants had dementia according to their scores on the MMSE; and the 2017 study by Ekström and colleagues vaguely reported only "few" cases of dementia in their sample (Ekström et al., 2017, pg. 5). The remainder of the studies that sought to determine prevalence rates found null reports of dementia within their populations (Hayes et al., 2012; Romano et al., 2020). Overall, outdated research revealed evidence of lower cognitive decline in incarcerated older adults compared to more recent reports. The potential reasons for this trend are discussed in Chapter 5.

Evidence for Risk Factors Associated with Cognitive Decline

Another theme that emerged in the research was compelling evidence of risk factors known to be associated with cognitive decline. As discussed in Chapter 2, clinical depression has been shown to lead to a two-fold increase in risk of dementia development (Byers & Yaffe, 2011). Other risk factors for cognitive impairment include alcohol or substance abuse, anxiety, or other psychiatric disorders. In their findings, Rosner and colleagues (1985) determined a spectrum of underlying factors. Out of the small sample size of 25 people, three participants reported chronic alcoholism, two participants had major affective disorder (outdated language for major depressive disorder), and one participant had acute anxiety disorder. Fazel and colleagues (2001) found that 50% of their sample had some sort of psychiatric diagnosis, and 29.5% of the sample reported depression. Despite the low rates of dementia in that study, the sample had high rates of risk factors for dementia diagnosis. The 2002 Fazel and Grann study also reported low incidence of dementia. However, the authors continued to expand on risk factor data, reporting that 15% of the sample had substance abuse disorder, and 8% had depression or anxiety (Fazel & Grann, 2002). Kingston and colleagues (2011) reported the highest rates of depression, with 83% of their sample experiencing depression, and 50% had an undisclosed diagnosable mental disorder. Hayes and colleagues (2012) reported 61% of their sample had a mental health disorder, with the most common being alcohol misuse disorder and depressive disorder. In 2018, Fitton and colleagues utilized the 6-CIT to report that 25% of their sample had depression and 19% alcohol misuse disorder. The leading study on the prevalence of depression in incarcerated older adults was conducted by Archuleta and colleagues (2019), who reported that older incarcerated adults report much higher rates of depression than non-incarcerated older individuals. Lastly, Verhülsdonk and colleagues (2020) also reported that 60% of their incarcerated sample reported

depressive symptoms. Overall, the gathered data provide strong evidence of mental health problems, including higher rates of depression in the older adult incarcerated population. Evidence of this nature should elicit further research to provide mental health services to this population, which might mitigate the risk of dementia and other later-life cognitive impairments.

As discussed in Chapter 2, the prison environment also exacerbates cognitive decline. This was evident in two studies (Lapornik et al., 1996; Verhülsdonk et al., 2020). In Lapornik and colleagues (1996), 14 participants experienced an increase in deterioration of cognitive functioning as the duration of their incarceration increased. Findings from more recent research by Verhülsdonk and colleagues (2020) confirmed the findings of earlier studies that there was a significant association between an incarcerated individual's cognitive scores over time and the duration of their incarceration. These findings support the data discussed in Chapter 2 that incarceration is a chronic and acute stressor, which may lead to further negative health outcomes for people who are incarcerated due to the physical and organizational structure of the prison environment. Overall, in this theme, multiple studies analyzed the effects of various biological, behavioral, and environmental risk factors (e.g., depression, substance and alcohol abuse) on cognitive decline, and how the prison environment can accelerate cognitive decline.

Existing Education and Programming

The final theme that emerged through analysis of the research was understanding current educational programs and health interventions addressing cognitive decline in incarcerated older adults. Three studies explored education and programming efforts with this population (Brooke

& Jackson, 2019; Treacy et al., 2019; Williams et al., 2009). Williams and colleagues (2009) studied how to maximize the role of correctional officers in serving the geriatric incarcerated population. This intervention found that one-third of the prison officers did not personally know their assigned people who were incarcerated. This reveals a starting place for future interventions to capitalize and strengthen the relationship between correctional staff and geriatric populations in prison. In their study, Treacy and colleagues (2019) applied and evaluated dementia-friendly community principles to the prison setting and delivered an educational intervention. Their findings reported that the education program significantly increased staff and incarcerated people's knowledge of dementia in prison. It also reported that after implementation of dementia-friendly community principles, incarcerated people reported that they were not stigmatized or discriminated against and were encouraged to live independently within the carceral setting at the 6-month and 1-year follow-ups. These findings support further research that applies dementia-friendly community principles to prison settings and increases awareness for effective educational programs.

The study by Stoliker and colleagues (2022) also considered education and training, along with their findings related to evidence of cognitive decline. They reported that the support staff within their study had a "general lack" of education and training regarding how to care for older adults experiencing cognitive decline. The last study that analyzed education and intervention was conducted by Brooke and Jackson (2019). In this study, the researchers sought to understand how prison staff, social workers, and people incarcerated without dementia supported those who were living in prison with dementia. They developed a program that created the role of a prisoner "buddy," where good-standing people who were incarcerated would serve in buddy roles for older people who were incarcerated and experiencing dementia. The results from this study show

the need for dementia-specific staff training, comprehensive training for the "buddies," the need for evolving educational programs, and recognition that because there are restrictions due to the nature of the carceral setting such programs may be impacted because of disruptions normal to prison settings. These findings propel further research in accounting for these items when developing other programs and further emphasize the need for holistic, comprehensive and setting-specific programming.

Summary

In Chapter 4, the demographics of this body of literature were discussed, including information regarding study design, sample size, country where the study occurred, and information surrounding the journals each study was published in. After synthesis of the 21 articles, four key themes emerged: (1) an assessment of the measures and tools utilized in the studies; (2) evidence or lack therefore of cognitive decline and (3) various risk factors associated with cognitive decline; as well as (4) attempts to understand education and existing programming on cognitive decline within this population. Each of those themes was explained through discussion, consolidation, and categorization of the individual findings of each article. The following chapter (Chapter 5) will discuss how the themes in the analysis of the articles confirm or refute what was discovered in the broader literature. This discussion describes the current state of the science surrounding cognitive decline in incarcerated older adults. Chapter 5 will tie together information, compare what emerged from the synthesis of these 21 articles with extant literature on the topic, explore further intervention strategies and research foci, and suggest future programming efforts. Strengths and limitations of both the body of literature, as well as

the review reported in this thesis, will be noted. Finally, Chapter 5 will also include implications and recommendations for policy, practice, and future education.

Chapter 5

Discussion

This mixed method review explores the most relevant literature on cognitive decline in the older adult incarcerated population. The previous chapters introduced the purpose of the thesis, discussed the significance of the problem, and provided foundational background information. Subsequent chapters detailed the research methods and discussed the results of the mixed method literature review. Chapter 5 will: (1) summarize the findings from the research; (2) discuss strengths and limitations; (3) provide implications and recommendations for policy, practice, and education; and (4) offer final conclusions from this thesis work.

Summary of Findings

Through analysis of this body of research, it is evident that cognitive decline is a relevant problem facing thousands of older adults who are incarcerated. Although studies varied in the level of cognitive decline in this population, evidence for ADRDs persisted. More recent studies in the past five years reported higher rates of cognitive impairment in their samples of incarcerated individuals compared to community-dwelling individuals. These findings could be due to myriad factors. First, more recent studies utilized more reliable and valid tools and screening measures to gather data. Second, more people are incarcerated currently compared to prior years due to the increasing incarceration rates discussed in Chapter 1. The people in the study samples may also have been chronologically older or imprisoned longer. These factors suggest an increased risk for cognitive impairment based on the biological and environmental factors discussed in Chapter 2. Lastly, in the studies that analyzed both rates of cognitive

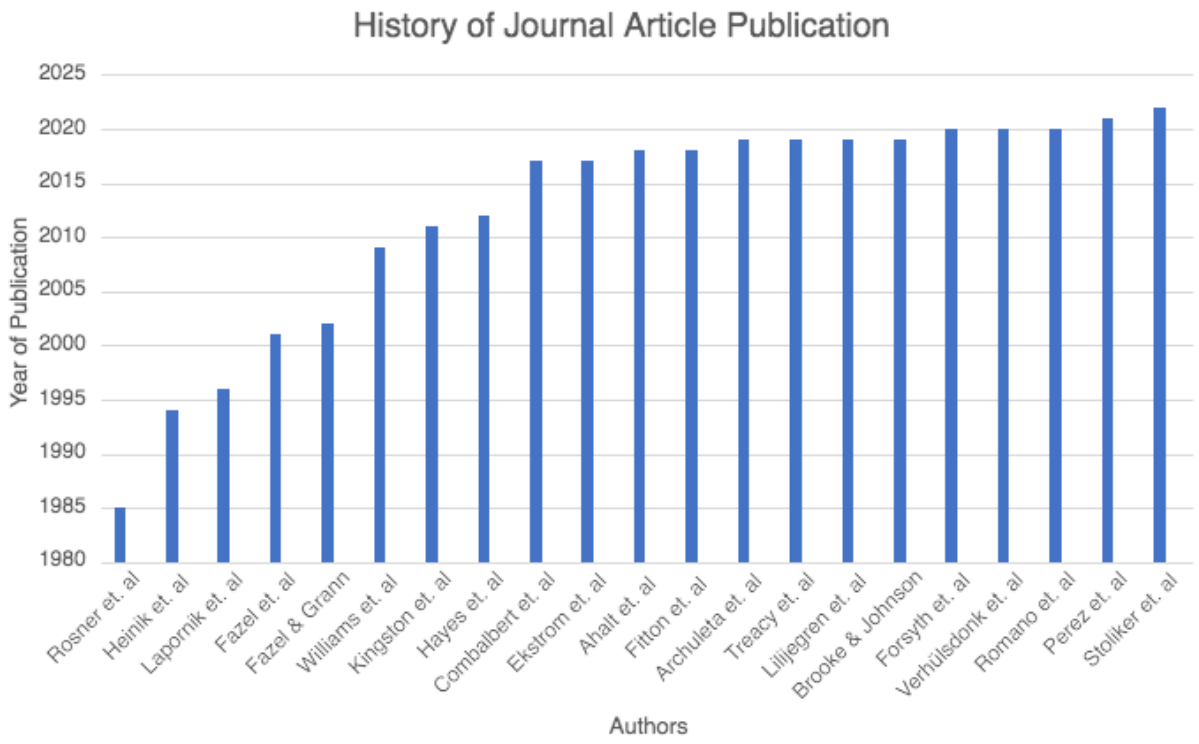
impairment and risk factors for cognitive impairment, rates for both were high, compared to those in the free community. In the study conducted by Verhülsdonk and colleagues (2020), rates of cognitive impairment exceeded 30% of their sample and rates of depression in the sample were 60%. The study also reported a significant association between scores on the MMSE and the individual's duration of incarceration. These findings align with discussions in the broader literature that suggest depression as a strong risk factor for dementia, and the prison environment as exacerbating cognitive impairment. The study by Ahalt and colleagues (2018) reported similarly high rates of cognitive impairment based on scores on the MoCA assessment (n= 25% of sample with cognitive impairment), as well as high prevalence of mental illness in the same population (45% of sample). These findings further support the literature discussing other mental illnesses as risk factors for cognitive impairment.

Other studies analyzed in this mixed methods review revealed lower rates of cognitive impairment in the older adult incarcerated samples, which is puzzling but still important to consider. Broader contextual factors may explain the lower prevalence rates. For example, studies that reported this outcome are older, which suggests they may have used less reliable measures and screening tools. These studies also may have had smaller samples due to fewer people being incarcerated at that time. Further, most studies that reported this low finding were conducted internationally. Specifically, the Romano and colleagues (2020) study was conducted in Italy, and the Hayes and colleagues (2012) article was conducted in the United Kingdom. Both these studies reported null findings of ADRD in their samples, potentially related to the healthcare and legal systems in place in the countries these studies were conducted in. For example, in 2017, Italy was ranked the "healthiest country on Earth" considering health risks, life expectancy, and quality of life rankings (Patel, 2019); and the United Kingdom only reported

13,609 prisoners aged 50 years or older currently serving sentences within their penal system (Age UK, 2019). This population is significantly smaller than the older incarcerated population in the US of over 200,000 individuals (Bronson, 2019).

A broad range of articles was collected in this review. Articles conducted internationally speak to the global nature of this issue. Gathering research spanning from 1985 – January 2022 was also important in revealing the historical importance and current relevancy of the issue. The figure below visually shows how published research on this topic has increased throughout the years. Overall, the level of evidence of cognitive decline in this population varied between the studies due to factors such as the strength of the measuring tools, trends in incarceration rates, and broader cultural contextual factors such as countries' legal and healthcare systems.

Figure 2: History of Journal Article Publication



Strengths and Limitations

This mixed methods review is unique in its holistic approach to understanding cognitive decline in older incarcerated adults. With all research, there are strengths and limitations. Conducting a mixed methods review as opposed to other review styles is a strength of this research since a mixed methods review considers distinct types of research methods, thus including a broader scope of studies. Other strengths of this research include the inclusion of internationally conducted studies (despite the limited applicability of findings to US populations), the broad timeline, and the interdisciplinary nature of the studies. The inclusion of international studies and publications shows the global attention given to the issue and provides information that may be important for US researchers to consider when developing additional US-based studies analyzing the same topics. As mentioned previously, the broad timeline of studies shows how research on this topic has expanded and increased. Recent articles published in 2021 and January 2022 also show the continued current relevance of the topic. Including studies published in journals of various disciplines also speaks to the interdisciplinary nature of this topic, which is important given the overlap between the healthcare and justice systems that this population is influenced by. This review also focused on evidence of cognitive decline as well as analyzed risk factors for decline. The review also accounted for current educational and programming efforts and discussed potential protective factors in attempts to inform future research. Other strengths noted from the analyzed studies include the involvement of both male and female incarcerated older adults in the samples of 10 studies (despite most incarcerated adults being male) and the use of highly sensitive screening measures.

While there are numerous strengths to this study, limitations must also be acknowledged. Some studies were published in lower-tier journals or newer journals with less time for articles to

be cited by other authors (refer to lower numbers in Table 3: Impact Factors). This indicates that the quality of the journals the studies were published in may not be as rigorous or reliable as others considered to be of higher quality, or that the articles may not have been published long enough for other researchers to react to their findings. This review also suffers from the "file drawer effect," since I did not probe for unpublished research findings or include grey literature that may have supported or disputed findings in the studies included in this review (Nagarajan et al., 2017). Further, in reviewing limitations noted by the authors of the articles, few studies accounted for cultural considerations of their research, which limits the generalizability of the findings. Studies also did not account for country-specific confounding factors, such as the healthcare or justice systems in each country, which both directly impact this topic through legal policies surrounding incarceration and the health implications of cognitive decline. Many analyzed studies also disregarded factors such as race, gender, or ethnicity which play key roles in the development, presentation, and severity of cognitive decline. Lastly, some study findings were based on qualitative data, which often results in deeper and richer findings; however, such studies may be subject to participant bias.

Overall, this research is strengthened by the interdisciplinary approach taken in the study and the inclusion of multiple timely, international studies. This research also notes limitations, including the varying strength of publications, the file drawer effect, and the lack of consideration for important cultural, policy, and demographic factors.

Implications and Recommendations

Currently, there are inadequate policies, practices, and education in the justice system surrounding the health of older incarcerated individuals, and particularly in those who may be experiencing cognitive decline. Although public research attention has recently expanded and increased (as evidenced in Figure 2: History of Journal Article Publication), most research only focuses on either the physical or mental health needs of the incarcerated older individual. Though this research is valuable, it fails to account for the overlapping and intersecting factors that shape the incarcerated older adult experience. This research advances the field through analyzing 21 interdisciplinary, salient research studies that address the growing evidence of cognitive decline in this population, the underlying risk factors, and current education and programming efforts being conducted within this population. This research is also timely and urgent to conduct due to the burgeoning older adult population in the prison system. The following sections describe how this study's findings might inform future policy, practice, and education.

Policy

Four key implications and recommendations for policy can be made based on this study. First, as stated in Chapter 1, there is no officially recognized chronological age definition for the older incarcerated population. Due to the stressors of the correctional settings, the lower SES of incarcerated individuals, and the unhealthier and riskier lifestyles adults who are incarcerated engaged in prior to incarceration, individuals who are incarcerated experience a more rapid aging process. Although most literature has adopted the age cut-off of 50-55 years as "elderly" for

these individuals, official policy should be proposed that defines older incarcerated adults as "elderly" at age 50 and above due to the more rapid physiological aging that occurs because of the prison environment. Second, policy should be formulated and implemented within the justice system that increases the frequency of conducting reliable health assessments that specifically include cognitive impairment screening for this population. As found in multiple studies, evidence of cognitive decline was only apparent in the samples after utilization of reliable screening measures. The MMSE and MoCA assessments are two widely used, reliable screening measures for cognitive function among older adults. Further, research should be conducted that determines the optimal screening measure for this population. If one does not exist, researchers should work to develop a cognitive impairment screening measure specifically made for older incarcerated adults. Finally, there has been a recent surge in research pertaining to effective alternative options for older incarcerated individuals to serve their time. In a review article by Bedard et al. (2016), the authors suggest potential alternatives like house arrest or relocation to secure nursing homes or hospice facilities for older incarcerated adults experiencing ADRD. Though an exploration of these options was beyond the scope of this mixed methods review, they warrant attention in future policy-focused research regarding the management of older adults who are incarcerated.

Practice

Two important implications and recommendations for prison-specific practices emerged from the findings of this research, one involving correctional staff and a second peer-to-peer support. First, the article by Williams and colleagues (2009) revealed how correctional officers

and staff are underutilized in caring for the geriatric incarcerated population. Despite their daily interactions with older incarcerated adults, one-third of the staff from the 11 correctional centers in California reported not knowing the health needs of their assigned incarcerated person (Williams et al., 2009). This finding reveals a social connection innate within the prison system that can be capitalized on when developing future intervention efforts.

Second, the study by Brooke and Jackson (2019) leveraged a different social connection within prisons: the relationships that form between incarcerated individuals. As explained earlier in this review, their intervention program created the role of a "buddy" for good-standing, younger individuals who are incarcerated to pair up with and care for older incarcerated individuals experiencing dementia. The findings from this study could shape ideas for other interventions that seek to utilize inmate-to-inmate connections. A similar intervention called "The Gold Coats" is in effect in the California Men's Colony State Prison (Ewing, 2015). This program trains healthy people who are incarcerated (donned in gold jackets) to care for those who are incarcerated and who are diagnosed with ADRD. The Gold Coat helpers serve as companions for the older adult, assist with activities of daily living, as well as lead classes and activities that are meant to stimulate memory. The Gold Coats are also financially compensated for their role. Although not fully explored within this review, this innovative program suggests successful ways to provide care for older incarcerated adults. Future intervention programs should utilize concepts from these existing interventions, as well as consider the research compiled in this review to develop effective, innovative, and manageable interventions.

Education

Finally, two important implications and recommendations for increased education and programming in justice, healthcare, and academic systems also emerged from the findings of this mixed methods review. As explained earlier in this thesis, the study conducted by Treacy and colleagues (2019) implemented dementia information sessions in their sample prisons. They found that knowledge about dementia increased significantly in attendees of the session. Education programs that detail simple information about dementia, including key messages about the disease and early signs and symptoms, are beneficial in increasing awareness and understanding within the correctional setting for those who are incarcerated and the correctional staff who care for them. Second, the recent article by Stoliker and colleagues (2022) determined a "general lack" of education and training for prison staff on how to care for older incarcerated adults needs. This finding exposes the need for future research to develop informative educational programs for prison staff.

Overall, the findings from these and other of the mixed method studies suggest that training and education programs are recommended for all correctional employees and healthcare workers. This review pointed to the need for the training to include: the definitions of "elderly" within the prison system an of cognitive impairment, resources and strategies that aid in identifying older incarcerated individuals displaying ADRD symptomology, and specific care support strategies. Within healthcare, educational programs should include the following: information on the management of dementia; how to utilize screening methods appropriately and effectively; and strategies for addressing broader comorbidities associated with cognitive decline. Lastly, within academia, research endeavors and education should continue to increase

to raise public awareness about this topic, develop more effective health strategies, and better care for this population.

Conclusions

This mixed method review explored the current body of literature surrounding cognitive decline in the incarcerated older adult population. In Chapter 2, background information was provided that discussed the biological, behavioral, and health-related underpinnings of the topic. In Chapter 3, the process by which articles were obtained and examined was explained. Salient information about the demographics of the body of literature was included before the description of the results in Chapter 4. Through the analysis of the 21 relevant studies, four key themes were determined: (1) differences in the measures and tools utilized in the studies; (2) evidence or absence of cognitive decline in the sample populations; (3) risk factors associated with cognitive decline; and (4) the current state of education and programming that exists for this population. Lastly, in Chapter 5, the findings were summarized and discussed, strengths and limitations were noted, and recommendations for policy, practice, and education were discussed.

Overall, the US justice system is experiencing an aging crisis, as the number of older adults incarcerated continues to increase without a commensurate increase in programs to support those adults. Policymakers within the justice and healthcare systems should consider the information presented in this thesis in the development of policies that establish higher qualities of care for incarcerated older adults experiencing ADRD. As mentioned, examples of such policies include determining 50 years old as the chronological age definition for “elderly” incarcerated individuals and mandating frequent cognitive screening tests in correctional

facilities. The findings from this work may also inform correctional staff and healthcare professionals about the prevalence of ADRD within this population and potential risk factors for development of cognitive decline. This information should also be considered in the development of innovative health intervention strategies that address the needs of this population. Finally, further academic research is needed that focuses on similar studies that would strengthen or enhance the findings of this research, assess other intervention and education programs, and seek to discover more connections between risk factors and subsequent negative cognitive outcomes. The work of this mixed method review brings attention to the needs of incarcerated older adults experiencing ADRD and informs further research endeavors that are necessary to develop care strategies for this vulnerable and overlooked segment of the incarcerated population.

Appendix A

Johns Hopkins Nursing Evidence-Based Practice Evidence Level and Quality Guide

Evidence Levels	Quality Ratings
Level I Experimental study, randomized controlled trial (RCT) Explanatory mixed method design that includes only a level I quaNtitative study Systematic review of RCTs, with or without meta- analysis	**QuaNtitative Studies** **A High quality**: Consistent, generalizable results; sufficient sample size for the study design; adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence. **B Good quality**: Reasonably consistent results; sufficient sample size for the study design; some control, fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence. **C Low quality or major flaws**: Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn.
Level II Quasi-experimental study Explanatory mixed method design that includes only a level II quaNtitative study Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis **Level III** Nonexperimental study Systematic review of a combination of RCTs, quasi-experimental and nonexperimental studies, or nonexperimental studies only, with or without meta-analysis Exploratory, convergent, or multiphasic mixed methods studies Explanatory mixed method design that includes only a level III quaNtitative study QuaLitative study Meta-synthesis	**QuaLitative Studies** No commonly agreed-on principles exist for judging the quality of quaLitative studies. It is a subjective process based on the extent to which study data contributes to synthesis and how much information is known about the researchers' efforts to meet the appraisal criteria. *For meta-synthesis, there is preliminary agreement that quality assessments of individual studies should be made before synthesis to screen out poor-quality studies*[1]. **A/B High/Good quality** is used for single studies and meta-syntheses[2]. The report discusses efforts to enhance or evaluate the quality of the data and the overall inquiry in sufficient detail; and it describes the specific techniques used to enhance the quality of the inquiry. Evidence of some or all of the following is found in the report: • Transparency: Describes how information was documented to justify decisions, how data were reviewed by others, and how themes and categories were formulated. • Diligence: Reads and rereads data to check interpretations; seeks opportunity to find multiple sources to corroborate evidence. • Verification: The process of checking, confirming, and ensuring methodologic coherence. • Self-reflection and scrutiny: Being continuously aware of how a researcher's experiences, background, or prejudices might shape and bias analysis and interpretations. • Participant-driven inquiry: Participants shape the scope and breadth of questions; analysis and interpretation give voice to those who participated. • Insightful interpretation: Data and knowledge are linked in meaningful ways to relevant literature. **C Low quality** studies contribute little to the overall review of findings and have few, if any, of the features listed for high/good quality.

Appendix B

Table of Measures

Abbreviation	Full Title	Year Developed or Published	Developer	Use
AUDIT	Alcohol Use Disorder Identification Test	1982	World Health Organization	Assessment tool for measuring alcohol consumption, drinking behaviors, alcohol-related problems
CSI'D'	The Community Screening Instrument for Dementia	1993	Hall et al	Assess dementia risk and determines if further clinical assessment is needed
DAST-10	Drug Abuse Screening Test	1982	Harvey Skinner	Screening tool for detecting drug abuse or dependence disorders
D- KEFS	Delis- Kaplan Executive Function System	2001	Dean Delis, Edith Kaplan, Joel Kramer	standardized assessment of higher-level cognitive functions in children and adults
DSM-2	Diagnostic and Statistical Manual	1975	American Psychiatric Association	Contains descriptions, symptoms, and basic criteria for diagnosing mental disorders
FAB	Frontal Assessment Battery	2000	Dubois B, Slachevsky A, Litvan I, Pillon B	Screening tool for frontotemporal dementia
FPI	Freiburger Personlichkeitsinventar	1970	Fahrenberg J, Selg H	Psychological personality test
GDS -15	Geriatric Depression Scale	1983	Yesavage et al	Method for screening geriatric depression
GMSE	Geriatric Mental State Examination	1975	Folstein et al	Internationally, widely used structured comprehensive clinical mental health assessment for older adults
ICD -9	International Classification of Diseases	1970	Centers for Disease Control and Prevention	foundation for health statistics and insurance billing; it also allows for international comparability in presentation of mortality statistics
MDS	Minimum Data Set 2.0	1988	Morris et al	Process mandated by the US federal government for use by nursing homes to assess residents and screen them to determine care needs

MMSE	Mini Mental State Examination	1975	Folstein et al	Widely used test of cognitive function among older adults
MoCa	Montreal Cognitive Assessment	1995	Ziad Nasreddine	Measure to detect mild cognitive impairment and Alzheimer's disease
MWT	Mehrfachwahl – Wortschatz Test	1995	Lehrl S, Triebig G, Fischer B	Multiple choice vocabulary test that estimates premorbid intelligence
PHQ- 8, 9	Patient Health Questionnaire Depression Scale	1990	Kurt Kroenke	Measure of current depression in the general population
SF- 12	Short Form -12	1996	Ware, Kosinski, Keller	Self-reported outcome measure assessing health in everyday life
SKT	Syndrom- Kurztest	2001	Erzigkeit	Short cognitive performance test used to assess deficits of memory and attention
SCID-II	Structure Clinical Interview for DSM – IV Axis II	1985	American Psychiatric Association	Tool to investigate patterns of personality disorders
TOPF	Test of Premorbid Functioning	2009	Weschler, D	Estimates pre-morbid cognitive and memory functioning
WHO QOL-BREF	World Health Organization Quality of Life Instrument	1995	World Health Organization	Quality of life assessment within the context of culture, values, goals, and standards
6- CIT	Cognitive Impairment Test	1999	Brooke, Bullock	Screening tool for identifying cognitive impairment in primary care settings

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ACADEMIC VITA

CHLOE E. MAZER

EDUCATION:

Major: Biobehavioral Health **Minor: Gerontology** May 2022

The Pennsylvania State University, University Park, PA
Schreyer Honors College, University Park, PA

HONORS & AWARDS:

Recipient, Slep Honors Scholarship in Health and Human Development 2018- 2022
Recipient, UP 4 Year Provost Award 2018- 2022
Recipient, Academic Excellence Scholar 2018- 2022
Recipient, Deans List, 8/8 Semesters 2018- 2022

RESEARCH:

Schreyer Honors College Undergraduate Thesis, University Park, PA 2021-2022
A Mixed Method Review of Cognitive Decline in the Older Incarcerated Adult Population
conducted under the supervision of Dr. Susan J. Loeb and Dr. Linda A. Wray

WORK EXPERIENCE:

Pregnancy Resource Clinic, *Development Intern* June-August 2020

- Served as social media chair for 5k fundraising event and curated social media posts
- Assisted staff with office duties including client intake forms and STI test results
- Continue to volunteer weekly at clinic (2020-2022)

Summer's Best Two Weeks, *Camp Counselor* Summer 2019, 2021

- Shepherded group of 10 teen girls in consecutive two-week sessions
- Refereed competitive team sports; taught and evaluated campers on proficiency

Heritage Hall Nursing Home, *Assistant Activities Director* May 2017-August 2018

- Aided residents in activities including BINGO, crafts, and ice cream socials
- Oversaw groups of residents during mealtimes, social events, and free time

LEADERSHIP EXPERIENCE:

Navigators Benefitting THON, *Overall Chair* 2020-2021

- Managed and facilitated group of 5 committee members in biweekly meetings
- Developed creative fundraising ideas; organized logistics of THON weekend
- Publicly communicated updates to larger organization of 200 active members

Undergraduate Teaching Intern, *BBH 316*: *Health Promotion and Prevention* 2019-2020

- Corresponded with group of 15 students weekly via emails regarding course materials
- Discussed class content and received leadership trainings weekly with professor
- Led small group discussions in lectures; graded students' assignments