

**Racial Disparities in Cognitive Functioning in Middle and Later Life: The  
Role of Stressors as Mediators and Social Resources as Moderators**

by

**Kazi Sabrina Haq**

**A Dissertation Submitted in Partial Fulfillment of the  
Requirements for the Degree of**

**DOCTOR OF PHILOSOPHY**

**in the Department of Sociology**

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University of Victoria**

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## **Abstract**

This dissertation explored the complex dynamics of racial disparities in cognitive functioning during middle and later life, examining the mediating role of stressors and the moderating influence of social resources within the Canadian context. Empirical analyses utilized baseline data from the ongoing Canadian Longitudinal Study on Aging, a survey of Canadians aged 45 to 85 years (n=51,338). Through ordinary least squares regression models, with survey weighting and multiple imputation for missing data, the study revealed the presence of racial disparities in cognitive functioning during middle and later life in Canada. Furthermore, using an intersectionality lens, the findings also revealed that race intersected with immigrant status and gender, influencing this health outcome as well. The application of the Stress Process Model (SPM) shed light on the mechanisms underlying these disparities. Both primary stressors (e.g., household income and homeownership) and secondary stressors (e.g., psychological stressors like self-rated general health, mental health, life satisfaction, and depression) mediated the relationship between race and cognitive test performance. Social resources such as marital status, social support and social participation demonstrated moderating effects on the relationship between specific stressors and cognitive functioning, and the moderation effect differs across races. Specifically, these social resources amplify the positive effects of some socioeconomic protective factors (i.e., reduced primary stressors) and subjective well-being factors (i.e., reduced secondary stressors/intrasychic strains) more for racial minorities than for whites.

These findings hold significant theoretical, research, and policy implications. A key theoretical implication of this study is the value of incorporating an intersectionality framework

into the SPM for an understanding of how race interacts with other identities to affect cognitive functioning through differences in exposure to various stressors and social resources. There is also a need for research that compares different racial groups to understand variations in exposure to various stressors and their impact on cognitive health. Further, with regard to policy, our findings point to the need for policymakers to address racial disparities in socioeconomic status (SES) and intrapsychic or psychological strains in order to reduce racial disparities in cognitive health outcomes. Additionally, policymakers should focus on enhancing the social support networks of members of racial minority groups and increasing their social participation levels in order to alleviate the negative effects of stress-related exposures. Finally, future research should explore the persistence of racial inequalities in cognitive health outcomes in Canada, examining how socioeconomic factors and subjective psychological well-being contribute to these disparities over time, and compare different racial groups to understand variations in discrimination exposure and its impact on health.

## Table of Contents

Supervisory Committee .....	ii
Abstract .....	iii
Table of Contents.....	v
List of Tables.....	vii
List of Figures.....	xi
Funding.....	xiii
Acknowledgement.....	xiv
Dedication .....	xv
Chapter One: Introduction .....	1
Chapter Two: Background in Theory and Research.....	6
2.1 Racial Disparities in Cognitive Functioning.....	7
2.2 An Intersectionality Framework.....	13
2.3 An Intersectionality Approach to Race, Gender and Immigrant Status Disparities in Health and Cognitive Functioning: A Review of the Empirical Evidence.....	15
2.4 The Stress Process Model.....	20
2.5 The Stress Process Model and Racial Disparities in Mental Health and Cognitive Functioning: A Review of the Empirical Evidence.....	26
2.6 Summary .....	65
Chapter Three: Conceptual Framework and Objectives .....	67
3.1 Conceptual Framework .....	67
3.2 Research Questions .....	69
3.3 Summary .....	72
Chapter Four: Methodology .....	73
4.1 Study Design and Sample .....	73
4.2 Measurement .....	75
4.3 Analytic Approach .....	93
4.4 Summary .....	102

Chapter Five: Findings .....	103
5.1 Descriptive Statistics .....	103
5.2 Hypothesis 1 .....	110
5.3 Hypothesis 2 .....	117
5.4 Hypothesis 3 .....	125
5.5 Hypothesis 4 .....	152
5.6 Summary .....	224
Chapter Six: Discussion and Conclusions .....	226
6.1 Research question 1 .....	226
6.2 Research question 2 .....	230
6.3 Research question 3 .....	233
6.4 Research question 4 .....	237
6.5 Limitations .....	240
6.6 Theoretical Implications .....	244
6.7 Research Implications .....	247
6.8 Policy and Practice Implications .....	255
6.9 Conclusions .....	257
References.....	259
Appendices.....	330
Appendix A.....	330
Appendix B.....	334
Appendix C.....	335

## List of Tables

Table 4.1: Pearson’s Correlations among Cognitive Test Scores.....	80
Table 4.2: T Test Results Comparing Cognitive Test Scores between Individuals with and without Memory Problems .....	80
Table 4.3: Pearson’s Correlations among Primary Stressors.....	83
Table 4.4: Pearson’s Correlations among Secondary Stressors.....	88
Table 4.5: Correlations among Social Resource Measures .....	92
Table 4.6: Correlations among all Independent Variables.....	98
Table 5.1.1: Descriptive Statistics for Variables included in the Analyses.....	107
Table 5.1.2: Comparison of Variables between Whites and Racial Minorities.....	109
Table 5.2.1: Ordinary Least Squares Regression: Racial Disparities in Rey-I and Rey-II Cognitive Test Performance (Whites vs. Non-Whites).....	112
Table 5.2.2: Ordinary Least Squares Regression: Racial Disparities in MAT and AFT Cognitive Test Performance (Whites vs. Non-Whites) .....	113
Table 5.2.3: Ordinary Least Squares Regression: Racial Disparities in Rey-I and Rey-II Cognitive Tests (Whites vs Other Racial Groups) .....	115
Table 5.2.4: Ordinary Least Squares Regression: Racial Disparities in MAT and AFT Cognitive Tests (Whites vs Other Racial Groups).....	116
Table 5.3.1: Interaction Effect of Race and Gender on Rey-I and Rey-II Cognitive Tests.....	119
Table 5.3.2: Interaction Effect of Race and Gender on the MAT and AFT Cognitive Tests.....	120
Table 5.3.3: Interaction of Race and Immigrant Status on the Rey-I and Rey-II Cognitive Tests.....	121
Table 5.3.4: Interaction of Race and Immigrant Status on the MAT and AFT Cognitive Tests.....	122
Table 5.4.1: Mediating Effect of Primary Stressors on the Relationship between Race and Rey-I Scores.....	127

Table 5.4.2: Mediating Effect of Primary Stressors on the Relationship between Race and Rey-II Cognitive Test Scores.....	132
Table 5.4.3: Mediating Effect of Primary Stressors on the Relationship between Race and MAT Cognitive Test Scores.....	134
Table 5.4.4: Mediating Effect of Primary Stressors on the Relationship between Race and AFT Cognitive Test Scores.....	137
Table 5.4.5: Mediating Effect of Secondary Stressors on the Relationship between Race and Rey-I Cognitive Test Scores.....	141
Table 5.4.6: Mediating Effect of Secondary Stressors on the Relationship between Race and Rey-II Cognitive Test Scores.....	143
Table 5.4.7: Mediating Effect of Secondary Stressors on the Relationship between Race and MAT Cognitive Test Scores.....	147
Table 5.4.8: The Mediating Effect of Secondary Stressors on the relationship between Race and AFT Cognitive Test Scores.....	150
Table 5.5.1: Interaction Effect of Race, Education and Marital Status on Rey-I and Rey-II Cognitive Test Scores.....	154
Table 5.5.2: Interaction Effect of Race, Education and Marital Status on MAT and AFT Cognitive Test Scores.....	155
Table 5.5.3: Interaction Effect of Race, Education and Network Size on Cognitive Test Scores.....	157
Table 5.5.4: Interaction Effect of Race, Education and Frequency of Contact on Cognitive Test Scores.....	159
Table 5.5.5: Interaction Effect of Race, Education and Social Support on Cognitive Test Scores.....	160
Table 5.5.6: Interaction Effect of Race, Education and Social Participation on Cognitive Test Scores.....	162
Table 5.5.7: Interaction Effect of Race, Household Income and Marital Status on Cognitive Test Scores.....	164
Table 5.5.8: Interaction Effect of Race, Household Income and Network Size on Cognitive Test Scores .....	166
Table 5.5.9: Interaction Effect of Race, Household Income and Frequency of Contact on Cognitive Test Scores .....	168
Table 5.5.10: Interaction Effect of Race, Household Income and Social Support on Cognitive Test Scores.....	170

Table 5.5.11: Interaction Effect of Race, Household Income and Social Participation on Cognitive Test Scores .....	172
Table 5.5.12: Interaction Effect of Race, Homeownership and Marital Status on Cognitive Test Scores .....	175
Table 5.5.13: Interaction Effect of Race, Homeownership and Network Size on Cognitive Test Scores .....	178
Table 5.5.14: Interaction Effect of Race, Homeownership and Frequency of Contact on Cognitive Test Scores.....	180
Table 5.5.15: Interaction Effect of Race, Homeownership and Social Support on Cognitive Test Scores.....	183
Table 5.5.16: Interaction Effect of Race, Homeownership and Social Participation on Cognitive Test Scores.....	184
Table 5.5.17: Interaction Effect of Race, SRH and Marital Status on Cognitive Test Scores.....	187
Table 5.5.18: Interaction Effect of Race, SRH and Network Size on Cognitive Test Scores.....	188
Table 5.5.19: Interaction Effect of Race, SRH and Frequency of Contact on Cognitive Test Scores.....	190
Table 5.5.20: Interaction Effect of Race, SRH and Social Support on Cognitive Test Scores.....	192
Table 5.5.21: Interaction Effect of Race, SRH and Social Participation on Cognitive Test Scores.....	193
Table 5.5.22: Interaction Effect of Race, SRMH and Marital Status on Cognitive Test Scores.....	195
Table 5.5.23: Interaction Effect of Race, SRMH and Network Size on Cognitive Test Scores.....	196
Table 5.5.24: Interaction Effect of Race, SRMH and Frequency of Contact on Cognitive Test Scores.....	198
Table 5.5.25: Interaction Effect of Race, SRMH and Social Support on Cognitive Test Scores.....	199
Table 5.5.26: Interaction Effect of Race, SRMH and Social Participation on Cognitive Test Scores.....	203

Table 5.5.27: Interaction Effect of Race, Life Satisfaction and Marital Status on Cognitive Test Scores.....	204
Table 5.5.28: Interaction Effect of Race, Life Satisfaction and Network Size on Cognitive Test Scores.....	206
Table 5.5.29: Interaction Effect of Race, Life Satisfaction and Frequency of Contact on Cognitive Test Scores.....	207
Table 5.5.30: Interaction Effect of Race, Life Satisfaction and Social Support on Cognitive Test Scores.....	208
Table 5.5.31: Interaction Effect of Race, Life Satisfaction and Social Participation on Cognitive Test Scores .....	210
Table 5.5.32: Interaction Effect of Race, Depression and Marital Status on Cognitive Test Scores.....	211
Table 5.5.33: Interaction Effect of Race, Depression and Network Size on Cognitive Test Scores.....	213
Table 5.5.34: Interaction Effect of Race, Depression and Frequency of Contact on Cognitive Test Scores.....	214
Table 5.5.35: Interaction Effect of Race, Depression and Social Support on Cognitive Test Scores.....	216
Table 5.5.36: Interaction Effect of Race, Depression and Social Participation on Cognitive Test Scores.....	219

## List of Figures

Figure 2.1: The Stress Process Model.....	22
Figure 3.1: The Stress Process Model as Applied to Racial Disparities in Cognitive Functioning.....	69
Figure 4.1: Baron-Kenny Four Steps Approach.....	95
Figure 5.3.1: Interaction Effect of Race and Gender on Rey-II Scores.....	120
Figure 5.3.2: Interaction Effect of Race and Immigrant Status on MAT Scores.....	123
Figure 5.3.3: Interaction Effect of Race and Immigrant Status on AFT Scores.....	124
Figure 5.4.1: Baron–Kenny Approach for Testing the Mediating Effect of Stressors on the Relationship between Race and Cognitive Test Performance.....	126
Figure 5.4.2: Baron-Kenny Method for Testing the Mediating Effect of Household Income on the Relationship between Race and Rey-I Scores.....	128
Figure 5.4.3: Baron-Kenny Method for Testing the Mediating Effect of Homeownership on the Relationship between Race and Rey-I Scores.....	130
Figure 5.5.1: Interaction Effect of Race, Education and Social Participation on Rey-I Scores.....	163
Figure 5.5.2: Interaction Effect of Race, Household Income and Social Support on AFT Scores.....	171
Figure 5.5.3: Interaction Effect of Race, Household Income and Social Participation on MAT Scores.....	173
Figure 5.5.4: Interaction Effect of Race, Homeownership and Marital Status on MAT Scores.....	176
Figure 5.5.5: Interaction Effect of Race, Homeownership and Marital Status on AFT Scores.....	177
Figure 5.5.6: Interaction Effect of Race, Homeownership and Social Participation on Rey-I Scores.....	185
Figure 5.5.7: Interaction Effect of Race, SRMH and Social Support on AFT Scores.....	200
Figure 5.5.8: Interaction Effect of Race, Depression and Social Support on MAT Scores.....	217
Figure 5.5.9: Interaction Effect of Race, Depression and Social Support on AFT Scores.....	218

Figure 5.5.10: Interaction Effect of Race, Depression and Social Participation on Rey-I Scores.....	220
Figure 5.5.11: Interaction Effect of Race, Depression and Social Participation on Rey-II Scores.....	221
Figure 5.5.12: Interaction Effect of Race, Depression and Social Participation on MAT Scores.....	222
Figure 5.5.13: Interaction Effect of Race, Depression and Social Participation on AFT Scores.....	223

## **Funding**

This work was funded by the Social Sciences and Humanities Research Council (SSHRC)

Doctoral Student Award

## **Acknowledgments**

I would like to express my gratitude to my supervisors, Dr. Margaret Penning and Dr. Min Zhou, for their invaluable guidance and support. Special thanks to Dr. Helena Kadlec for her assistance with the dataset.

## **Dedication**

This dissertation is dedicated to my parents, siblings, niece and husband

# CHAPTER ONE

## INTRODUCTION

Inequalities in health outcomes have long been influenced by social structural locations like race, gender, and immigrant status (Cummings and Jackson, 2008; Hargrove et al., 2020), alongside disparities in access to social resources including social networks and social support (Bedaso, Adams, Peng and Sibbritt, 2021; Fiori, Antonucci and Cortina, 2006; Jaspal and Breakwell, 2022). This study assesses racial disparities in cognitive functioning in middle and later life, employing an intersectionality approach to investigate how interactions between race and other structural locations, including gender and immigrant status, lead to disparities in cognitive functioning. It also scrutinizes the mechanisms, including primary and secondary stressors that link such disparities to cognitive functioning. Furthermore, it examines the moderating effects of social resources on these relationships. The study draws on the Stress Process Model (SPM - Brown et al., 2020; Lam and Campbell, 2022; Meyer et al., 2022; Pearlin, 1990, 2010; Pearlin and Bierman, 2013) to guide these analyses. This model conceptualizes the stress process as one in which social structural factors such as racial minority status influence individual health through stress exposure and moderation.

Extensive research (Diaz-Vebegas, Downer, Kenneth, Langa and Wong, 2016, 2019; Forrester et al., 2019; Garcia et al., 2019) has been conducted on racial disparities in cognitive functioning. The findings indicate racial differences in cognitive functioning in later life.

However, most of this research has been carried out in the United States (US) and has focused on black, Hispanic and white comparisons. Even though the comparisons have yielded important findings, gaps in knowledge remain as other racial minority groups have not received much attention. As well, even though several studies (e.g., Brown, 2018; Garcia et al., 2019; Henderson et al., 2022; Hill-Jarrett and Jones, 2019; Mullings and Schulz, 2006; Warner and Brown, 2011) have focused on the effect of race and gender interactions on cognitive functioning, none of them used the intersectionality framework to understand the interaction effect. Also, no studies so far have used the framework to assess the effect of race and immigrant status on cognitive health. A vast array of studies have documented that women are more likely to experience cognitive decline compared to men (Chinn and Hummer, 2016; Hale, Schneider, Mehta and Myrskylä, 2020). Therefore, it is imperative to understand the experience of an individual who is a member of several minority groups (e.g., a black woman). The intersection of multiple marginalised identities that might expose them to certain stressors underlying the risk of negative health outcomes like poor cognitive functioning needs to be studied using the intersectionality framework.

Also, a review of the empirical literature reveals the inadequacy of research on the mechanisms that explain racial disparities in cognitive functioning, the impact of differences in exposure and vulnerability to various stressors related to racial minority status, and the role of social resources with regard to associations between these stressors and cognitive functioning. For example, the stressors related to race can be context-dependent. Therefore, despite similarities between the US and Canada, differences in their racial composition (Statistics Canada, 2017; US Census Bureau, 2016), in the socioeconomic and other characteristics of members of different racial minority groups, in their histories of racial segregation and

discrimination (Hou, Wu, Schimmele and Myles, 2015; Veenstra and Patterson, 2016; Walker, 2013), and in their health care systems and experiences (Unruh et al., 2021), may result in differences in the kind and levels of stressors that are encountered, the nature and role of social resources and other mediators and moderators, as well as differences in health outcomes (Brown et al., 2020; Haq and Penning, 2020; Mohanty et al., 2022; Nagy et al., 2022; Prus, 2011; Prus et al., 2010; Staben et al., 2022).

Also, there is substantial evidence that social resources like social networks, social support, social participation can mediate and/or moderate health outcomes (e.g., Antonucci, Ajrouch and Janevic, 2003; Gorman and Sivaganesan, 2007; Mouzon et al., 2013) in general and cognitive functioning (Perry et al., 2021; Poye, Burr and Roberts, 2022) specifically. Yet, very few studies (Katz et al., 2020; Sheffler and Sachs-Ericsson, 2015) have examined the role that social resources play in mediating or moderating racial disparities in cognitive functioning. Moreover, these studies did not focus on the moderating role of social resources on the relationship between the stressors experienced by minority group members and cognitive functioning. Given the effect of minority stressors on health (Morris et al., 2022; Sheffler and Sachs-Ericsson, 2015; Stinchcombe and Hammond, 2021) resulting in outcomes like cognitive impairment, this knowledge gap must be addressed.

Taken together, despite frequent use of the SPM in elucidating relationships between stressors, psychosocial resources and health outcomes in general, there is limited evidence of its utility in explaining cognitive functioning. Also, studies that draw on the SPM tend to consider socioeconomic status (SES) as a background/contextual factor rather than as a stressor that can derive from other social statuses like racial or gender position. Even though lower SES gives rise to various chronic and acute stressors, lower SES itself can be the result of background factors

like racial minority position (Aroke et al., 2019). There is substantial evidence that lower SES can be a chronic stressor, resulting in negative health outcomes (Aroke et al., 2019; Doan, Dich and Evans, 2014; Hoebel, Maske, Zeeb and Lampert, 2017).

These knowledge gaps must be addressed in order to more adequately understand the process through which racial disparities influence cognitive functioning in middle and later life in Canada. Therefore, to address these gaps, this study draws on a modified version of the SPM model to examine racial disparities in cognitive functioning and address the mechanisms that account for these disparities. This version of the SPM integrates an intersectionality approach by focusing on racial position and its intersection with gender as well as immigrant status as background or contextual factors. The mechanisms conceptualized as linking racial position and cognitive functioning include exposure to stressors like lower SES (e.g., lower education, lower income) and intrapsychic or psychological strain (i.e., as reflected in poor self-rated general and mental health, lower levels of life satisfaction and depression). Finally, the present study also focuses on the role of social resources (e.g., marital status, social networks, social support, social participation) in mediating relationships between racial disparities, exposure to socioeconomic stressors and cognitive functioning.

To address these gaps in knowledge, the study draws on baseline data from the Canadian Longitudinal Study on Aging (CLSA) from 51,338 Canadians aged 45 to 85 years of age. In order to provide an understanding of how much we know so far about the relationship between race and cognitive functioning, Chapter 2 provides an in-depth review of the literature available on racial disparities in cognitive functioning as well as two theoretical frameworks that appear useful for an understanding of these disparities (i.e., an Intersectionality Framework and the SPM), and the research evidence currently available with regard to these frameworks. This

chapter also identifies the research gaps that exist in research on this issue to date. Chapter 3 presents the conceptual framework as used in this study along with the research questions and hypotheses. Chapter 4 describes the research methods that have been chosen based on the review of the literature, research questions being studied, and the data available. Chapter 5 presents the results of the analyses, including a description of the study sample and the findings derived from hypothesis testing. Finally, Chapter 5 discusses the results with respect to the research questions and in comparison with previous studies. It also discusses the limitations of the study, the theoretical implications of the findings, and offers suggestions for future research, policies and practices.

## **CHAPTER TWO**

### **BACKGROUND IN THEORY AND RESEARCH**

This chapter provides an overview of the research evidence and theoretical frameworks that are relevant to the objectives being pursued in this study. The first subsection focuses on evidence linking racial status and disparities in levels of cognitive functioning in middle and later life (Chen et al., 2022; Smith and Johnson, 2018). It also includes discussion of the Intersectionality Framework (Crenshaw, 1991) with a focus on the intersection of race and other social positions (e.g., gender, immigrant status) that are relevant to cognitive functioning in middle and later life (Gee and Ford, 2011; Williams et al., 2012). The following subsection outlines the Stress Process Model (Pearlin, 1989; Pearlin and Bearman, 2013) that is being drawn upon to assess racial disparities in cognitive functioning. Next, research on the relationships between racial minority status, various stressors, and cognitive functioning is reviewed (Barnes et al., 2012; Lewis et al., 2018). The next subsection looks at evidence regarding the mediating and moderating roles of social resources with regard to relationships between stressors and health outcomes (Thoits, 2010; Umberson et al., 2018). The chapter then discusses research that delineate differences in access to social resources like social networks, social support, and social participation by racial minority and non-minority groups (Kawachi and Berkman, 2001; Taylor et al., 2019). By synthesizing these research findings and theoretical frameworks, this chapter provides a comprehensive overview of current knowledge regarding the complex interplay

between race, stress-related exposures, social resources, and cognitive functioning during middle and later life.

## **2.1 Racial Disparities in Cognitive Functioning**

"Cognitive functioning," as defined by Kiely (2014), encompasses a range of mental processes, including perception, memory, learning, attention, decision-making, and language abilities, crucial for knowledge acquisition and reasoning. When performance within these domains declines, it is termed "cognitive impairment," varying in severity from mild to severe (Roy, 2013). "Mild cognitive impairment (MCI)" serves to describe the stage between normal cognitive functioning and clinical dementia (Petersen et al., 2018), although the relationship between MCI and early dementia remains a subject of debate (Bruscoli and Lovestone, 2004). When cognitive impairment reaches a level where it significantly disrupts daily activities, it is typically diagnosed as "dementia" (Hugo and Ganguli, 2014). "Dementia," encompassing various causes of profound cognitive impairment such as "Alzheimer's disease (AD)," "Vascular dementia (VD)," and "Lewy body dementia (LBD)," profoundly affects perception, memory, learning, attention, decision-making, language abilities, and the capacity to carry out everyday tasks (Fymat, 2019).

According to recent estimates, at least one-quarter of the population aged 65 and older has some level of cognitive impairment. AD stands out as the most prevalent cause of dementia, accounting for 60% to 70% of all dementia cases, as reported by the Public Health Agency of Canada (2022). AD is characterized as "a neurodegenerative disorder of uncertain cause and pathogenesis that primarily affects older adults" (Wolk and Dickerson, 2016, p. 1). In the United

States, estimates suggest a prevalence rate exceeding ten percent (10.7%) (Alzheimer's Disease Facts and Figures, 2018) with an additional 22% experiencing cognitive impairment without dementia (Manly et al., 2022). In Canada, reported rates are slightly lower, with the prevalence of dementia estimated at 7.1% (PHAC, 2017) and a further 17% estimated as having mild cognitive impairment (often labelled "cognitive impairment - no dementia or CIND")(Graham et al., 1997).

Numerous studies have reported evidence of racial disparities in cognitive functioning in later life. Most of these studies are cross-sectional and are based on comparisons of black, Hispanic and white middle-aged and/or older adults. For example, scholars working in this area have found blacks<sup>1</sup> and/or African Americans to be at greater risk of cognitive impairment compared to their white counterparts in the United States (Chen et al., 2022; Garcia et al., 2018; Sloan and Wang, 2005; Zhang, Hayward and Yu, 2016; Zsembic and Peek, 2001), with similar findings sometimes also reported in comparisons of whites with other ethno-racial groups such as those identified as Hispanic or Latino (Díaz-Venegas et al., 2019; Garcia et al., 2018). For example, in a recent cross-sectional study conducted by Chen et al. (2022) with a sample comprising 5,262 white and 685 black middle-aged and older adult participants, it was observed that black individuals exhibited relatively lower levels of episodic memory and executive function in comparison to white individuals. Similarly, Díaz-Venegas et al. (2019) used data from the 2010 wave of the US Health and Retirement Study (HRS) to examine cognitive functioning in specific domains (verbal memory, working memory, numeracy) by race (Hispanic, black, white). They found that non-Hispanic blacks had significantly lower scores for

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<sup>1</sup> The terms 'blacks' and 'African Americans' have been used in this study as they were employed by the authors of the respective sources. It is worth noting that these terms are sometimes used interchangeably, even though African Americans specifically refer to an ethnic group with African ancestry. Additionally, it is important to recognize that individuals who identify as "black" can be found in various countries such as the Caribbean, Barbados, and others.

all three measures than non-Hispanic whites. They also observed that all Hispanic subgroups had lower scores for each cognitive domain relative to non-Hispanic whites. Further, Manly et al. (2022) report findings indicating that dementia was more prevalent among non-Hispanic black individuals whereas MCI was more prevalent among Hispanic individuals compared with non-Hispanic white individuals.

In the Canadian context, relatively little research has been devoted to examining racial disparities in cognitive functioning. To date, only two studies, both cross-sectional, have addressed relationships between racial minority status and cognitive functioning in middle and/or later life. Haq and Penning (2019) used the Canadian Community Health Survey 2009-2010 dataset to examine the social determinants of racial/visible minority group<sup>2</sup> disparities in cognitive functioning among people aged 60 years or older. Their findings revealed that those identifying themselves as belonging to racial/visible minorities were more likely to report lower levels of cognitive functioning in comparison with non-minority whites. In the other study, Stinchcombe and Hammond (2022) used baseline data from the Canadian Longitudinal Study on Aging (CLSA) to examine the correlates of cognitive functioning among non-institutionalized adults aged 45-85 years. Their findings indicated that compared to respondents who reported their race as white, those who identified themselves as black, Indigenous, or another non-white racial minority had poorer baseline memory and executive function scores.

In addition to studies that focus on cognitive functioning outcomes, cross-sectional studies have also acknowledged the greater risk of AD and/or other forms of dementia among racial minority group members compared to whites (e.g., Chen et al., 2020; Weuve et al., 2018; Zhang,

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<sup>2</sup> “The Employment Equity Act defines visible minorities as persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour”(Statistics Canada, 2015).

Hayward, and Yu, 2016). Although most studies focusing on dementia among racial minority groups report finding higher rates of dementia among blacks compared to whites, some studies have also reported finding higher rates of dementia among other racial groups. For example, Mayeda, Glymour, Quesenberry and Whitmer (2016) found dementia incidence was highest among African Americans and American Indian/Alaskan Native groups, lowest among Asian Americans, and intermediate among Latinos, Pacific Islanders, and whites. Based on their systematic review of studies focusing on dementia prevalence and incidence rates in the US, Mehta and Yeo (2017) reported higher rates of dementia prevalence and incidence among African American and Caribbean Hispanic groups compared to white, Japanese American and Mexican American groups. However, another study conducted in the US (Wright et al., 2021) showed that Hispanics were at the highest risk of dementia compared to blacks and whites while blacks were also more likely than whites to have dementia. Similarly, in the United Kingdom, Pham and colleagues (2018) compared the prevalence of dementia among black, white and Asian residents and found higher rates of dementia among blacks compared to whites, but lower rates among Asians compared to whites. However, both Díaz-Venegas et al. (2019) and others note that the evidence that older Hispanics are at an increased risk for Alzheimer's disease or related dementia (ADRD) than non-Hispanic whites is less clear (Gurland et al. 1999; Fitzpatrick et al. 2006; Katz et al. 2012; Mayeda et al. 2014, 2016).

In contrast, longitudinal studies report less consistent findings. On the one hand, some studies report finding a faster rate of cognitive decline among non-whites than whites. For example, Sachs-Ericsson and Blazer (2005) found that older African Americans experienced greater cognitive decline (using a global measure of cognitive functioning) compared to their white counterparts over a three-year period. Similarly, Lee et al. (2011) reported findings

indicating that older African Americans with MCI experienced faster rates of cognitive decline compared to non-African Americans in a three-year longitudinal study. Alternatively, other studies (e.g., Zahodne et al., 2016) have reported findings indicating that African Americans and/or other non-white racial groups have slower rates of cognitive decline than whites. For example, Sloan and Wang (2005) found differences in cognitive functioning when comparing whites and non-whites aged 70 and older at baseline (with lower cognitive functioning evident among African Americans and Hispanics compared to whites). However, seven years later, although performance on cognitive tests declined in all three groups, the rate of decline was somewhat slower among non-whites than whites. Still others report finding little or no racial difference in rates of cognitive decline when comparing older blacks or African Americans, Hispanics, and/or Caucasians (Carvalho et al., 2014; Early et al., 2013; Gross et al., 2015; Masel and Peek, 2009; Schneider et al., 2012; Sisco et al., 2015; Wilson et al., 2010). For example, Castora-Binkley, Peronto, Edwards, and Small (2015) found significant racial/ethnic differences when comparing older black, Hispanic and white adults in baseline cognition but no significant differences in the rate of decline over a 12-year period (1998–2010). Similarly, in a more recent longitudinal study, Zuelsdorff et al. (2020) demonstrated that, in a sample of African American and white middle-aged and older adults, African Americans performed more poorly on tests in two cognitive domains (speed and flexibility, working memory) compared to whites at baseline. However, no significant difference was observed in the rate of cognitive decline over a four-year period. In their longitudinal study using the Health and Retirement Study dataset, Chen and Zissimopoulos (2018) observed a 25% decline in dementia prevalence among both white and black populations from 2000 to 2012, while Hispanics experienced only an 8% decrease.

Several explanations for differences in the findings of cross-sectional and longitudinal studies have been noted. For example, since members of racial minority groups tend to be at greater risk of poor cognitive functioning, they may also be more likely to be excluded from follow-up studies, either because they were too cognitively impaired to participate, were institutionalized, or had died during the study period (Zahonde et al., 2016). The implication is that had they been included in the follow-up studies, a higher rate of cognitive decline would likely be evident among racial minority group members. Also, the higher mortality rates evident among racial minority group members is another reason for the disparities disappearing during follow-up (Zhang, Hayward and Yu, 2016). For example, racial disparities in mortality rates mean that fewer African Americans reach late life compared to whites due to lower life expectancy and higher mortality rates in early and middle life (Zahodne et al., 2016). If those who died in the earlier years of life were also those most at risk of experiencing cognitive decline in their later years, this could account for lower rates of decline found among minority group members. The same would be true if whites who were most likely to experience cognitive decline in their later years were more likely to survive into older age.

Overall, a review of studies that have focused on racial disparities in cognitive functioning and dementia suggests that at any given point in time, such disparities do appear to exist, with those classified as non-white often reported to fare more poorly than those classified as white. However, the vast majority of studies have been carried out in the US and while black or Hispanic versus white racial disparities have been highlighted, scarce attention has been paid to other countries and other racial minority groups, including those more prevalent in the Canadian context (e.g., South Asian, Chinese).

## 2.2 An Intersectionality Framework

Research addressing racial disparities in cognitive functioning has tended to focus on them independently from other social disparities such as those associated with gender, immigrant status and so on. However, intersectionality theorizing draws attention to the implications of overlapping social identities, emphasizing the complex interplay between race, gender, immigrant status, and other factors in shaping health outcomes. This underscores the necessity for research that acknowledges the intersecting impacts of various dimensions of inequality, facilitating a deeper comprehension of cognitive health disparities within diverse populations.

An intersectionality framework has its origins in black feminism and critical race theory. During the 1980s, black scholars began to replace additive models (e.g., that focused on the independent or additive implications of occupying more than one disadvantaged social positions such as the effects of being black plus being a woman) to analyze black women's experiences. Instead, they came up with a framework that provides an understanding of the effects of interlocking systems of oppression (e.g., race and gender). The term 'intersectionality' was coined by Crenshaw, a black feminist, in 1991. This paradigm sheds light on the fact that oppression can be the result of the interconnectedness of different social positions (Collins, 2000). For example, individuals with intersecting identities (e.g., South Asian immigrant women) are potentially exposed to stressors "across multiple axes of marginalization" (Schmitz, Robinson and Sanchez, 2020, p.835) due to their disadvantaged social locations.

This system of interlocking oppressions influences the experiences of those situated inside the system. According to Collins (1995), "the notion of interlocking oppressions refers to the

macro-level connections linking systems of oppression such as race, class, and gender. This is the model describing the social structures that create social positions. Second, the notion of intersectionality describes micro level processes - namely, how each individual and group occupies a social position with interlocking structures of oppression described by the metaphor of intersectionality. Together they shape oppression.” (as cited in Dressel, Minkler and Yen, 1997, pp. 583-584).

An intersectionality framework allows us to gain an understanding of the individual life experiences that are shaped by the interaction of different identity categories (e.g., race, gender, social class, sexual orientation, religion) simultaneously instead of considering each identity separately. Hulko (2009) used the term ‘social location’ as an example of the intersectionality of our social identities – our position within the interlocking systems of oppression (e.g. racism, classism) determines if we will be disadvantaged or privileged as it attributes power. However, such intersections are also considered to be fluid as the power ascribed to social groups depends on social context as well as time (Hulko, 2009).

This framework has become popular in gerontology due to its contribution to research exploring the experience of being older while also occupying various other statuses (e.g., racial/ethnic, gender) as well as their combined effect on the health of individuals (Chappell, Dujela and Smith, 2015). There is substantial evidence that racial minorities, including blacks, are more likely to experience more acute and chronic health conditions like diabetes, heart disease, stroke as well as shorter life expectancies and lower cognitive functioning compared to whites (Farmer and Ferraro 2005). This has been attributed to the marginalization of racial minority group members and the privileged positions of whites (Hummer and Hayward 2015). In contrast, Hispanics are likely to have fewer chronic conditions and slightly longer life

expectancies (Lariscy, Hummer, and Hayward 2015) compared to blacks. However, it is worth questioning if whites are in an equally privileged position when they are women or immigrants. Therefore, just one status does not suffice to explain the marginalized position of an individual and an intersectionality approach is the best approach to study the effect of the interaction of several statuses of one person in this regard.

### **2.3 An Intersectionality Approach to Race, Gender and Immigrant Status**

#### **Disparities in Health and Cognitive Functioning: A Review of the Empirical Evidence**

There are reasons to expect that racial disparities may intersect with those associated with gender and other social locations in influencing cognitive and other health outcomes. It is often assumed that because women tend to live longer than men, they are likely to be at higher risk of cognitive impairment and dementia (Gao, Hendrie, Hall and Hui, 1998; Mangialasche, Kivipelto, Solomon and Fratiglioni, 2012; Solomon, Kivipelto and Soininen, 2014). Yet, when examining gender differences in cognitive tests such as memory and executive functioning, research often indicates either no gender differences (Graham et al., 2014) or a tendency for women to outperform men, particularly in verbal tasks, while men perform better in spatial tasks (Asperholm et al., 2019; Avila et al., 2019; Westrick et al., 2024). For example, McDougall et al. (2014) observed no gender disparities in memory performance among older adults in the US, whereas Westrick et al. (2024) found older women outperforming men in memory tests in the US but underperforming men in India. Although some studies suggest minimal gender disparity in executive functioning (Grissom and Reyes, 2019), findings are

inconsistent (Ferguson et al., 2021). With regard to dementia, prior research has consistently found that older women experience higher rates (both incidence and prevalence) of AD and other dementias (Levine et al., 2023; Mazure and Swendsen, 2016; Sinforiani et al., 2010) than older men, especially after the age of 80 (e.g., Fratiglioni et al., 1997; Letenneur et al., 1999).

However, longitudinal findings regarding gender differences in cognitive decline and dementia are less consistent: some studies show no differences among older adults (e.g., Barnes et al., 2003; Kawas et al., 2001) while other studies (Sesgadari and Wolf, 2007) do find gender differences. For instance, in a longitudinal study conducted by Levine et al. (2023), it was revealed that despite women initially outperforming men in cognitive tests at baseline, they experienced a faster rate of cognitive decline (including global cognition and executive function) compared to men as they aged. Conversely, McCarrey et al. (2016) in their longitudinal study, reported that males initially excelled in visuospatial tasks, while females performed better in most other cognitive tests. Over time, however, men experienced more pronounced declines on measures of mental status, perceptuomotor speed and integration, and visuospatial ability, underscoring older women's greater ability to withstand age-related cognitive decline. Others report a greater risk of developing AD among women than men (Fratiglioni et al., 1997) but a lower risk of vascular dementia among women than men (Podcasy and Epperson, 2022). Yet, Barnes et al. (2003) report no evidence of gender differences in the risk of developing AD.

To date, only a few studies have used an intersectionality approach to examine race/gender differences in health. A majority of these studies have focused on their implications for physical health outcomes and report findings suggesting that whereas white women tend to have better health than other intersecting status groups, non-white women tend to have poorer health. For example, Warner and Brown (2011) focused on physical health outcomes and found that black

and Mexican American women had the highest rates of functional limitations while white men had the lowest rates. Lee, Park and Boylan (2021) found that in terms of cardiovascular disease, white women were the healthiest, followed by white men, black men and black women. Further, a Canadian study (Veenstra, 2011) that used an intersectionality approach to examine the impact of race and gender intersections on self-rated health (SRH) found that South Asian women reported poorer SRH compared to South Asian men, white men and white women. Similarly, in a study conducted in the US, Brown et al. (2016) found evidence of gendered racial inequality in SRH, such that black and Mexican American women reported poorer SRH, whereas white men reported the highest SRH, again supporting the notion of intersectionality.

Fewer studies have addressed the joint effects of race and gender on cognition in later life (Avila et al., 2019). Those that have report inconsistent findings. For example, Hale et al. (2022) discovered that black and Latino women experienced a greater degree of cognitive impairment when compared to black and Latino men, as well as white men and women. Avila et al. (2019) report finding differences in rates of decline in memory and visuospatial abilities that were not evident when looking at sex/gender and race separately. Specifically, after adjusting for age and education, they found that the largest differences in baseline cognitive scores were between white women and black men on memory and between white men and Hispanic and black women on visuospatial and language abilities. Black and Hispanic women also fared better than black and Hispanic men on memory performance; however, non-Hispanic white women obtained higher scores than all other gender/racial groups. Lastly, they observed that memory and visuospatial decline were more pronounced among black women compared to Hispanic men and white women. However, in a more recent longitudinal study, Johnson et al. (2022) compared the impact of race as a predictor of cognitive decline and the development of Alzheimer's disease

among middle-aged and older men and women. With a focus on measures of verbal fluency, naming, and immediate/delayed story memory over five years, they found that whereas blacks had lower scores than whites on most baseline cognitive measures, these findings did not differ by gender. As well, there were few racial differences in cognitive performance over time. They note that blacks declined at the same rate if not more slowly than whites and were equally likely to be diagnosed with AD, regardless of gender.

In addition to gender, there are also reasons to expect that racial disparities may intersect with those associated with immigrant status. To date, however, only a few studies have looked at the interaction of race and immigrant status in influencing health outcomes. Dallo, Booza and Nguyen (2015) reported that after adjusting for covariates, foreign-born Arab Americans in the US showed a higher likelihood, while foreign-born Asians, Hispanics, and blacks exhibited lower likelihoods of functional limitations compared to foreign-born non-Hispanic whites. Conversely, US-born Arab and Asian Americans displayed lower likelihoods, whereas Hispanics and blacks revealed higher likelihoods of functional limitations compared to US-born non-Hispanic whites. In the Canadian context, Kobayashi and Prus (2012) found evidence indicating that more recent middle-aged immigrant males in racial minority groups exhibited health advantages compared to their Canadian-born counterparts, which they attributed to the Healthy Immigrant Effect (HIE).<sup>3</sup> In contrast, older immigrant men in racial minority groups showed disadvantages compared to older non-immigrant men in racial minority groups. However, the pattern was reversed for racial minority immigrant women as middle-aged women reported poorer health compared to their non-immigrant counterparts and older women reported better

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<sup>3</sup> The “Healthy Immigrant Effect” refers to the fact that when immigrants first arrive in developed countries, they tend to be healthier compared to their native-born counterparts but often experience declining health over time following immigration (Jasso et al., 2012; Kennedy et al. 2015).

health compared to their Canadian-born counterparts. The HIE was stronger for racial minorities compared to whites in their study. Similarly, in a study involving individuals over the age of 50, Brown (2018) found that the Healthy Immigrant Effect was evident solely among white immigrants, with black and Mexican immigrants experiencing health deterioration (e.g., functional limitations and chronic conditions) at younger ages.

Research on associations involving race, immigrant status and cognitive functioning is inconclusive. Some researchers suggest that the HIE is also evident in later life, resulting in good cognitive health among older immigrants in racial minorities. For example, Hill et al. (2012) found that Mexican Americans aged 65 and older (who immigrated between the ages of 20 and 49) exhibited better cognitive functioning at baseline than their US-born counterparts. Additionally, in a separate study, Waden et al. (2017) found that immigrant Mexican Americans had half the odds of cognitive impairment compared to US-born whites at baseline. Moreover, they demonstrated a 50% lower risk of cognitive decline incidence over 10 years compared to US-born Mexican Americans.

However, other studies report contradictory findings (Sachs-Ericsson et al., 2009, Sheffield and Peek, 2009). For example, several studies (Collins et al., 2009; Miranda et al., 2009; Nguyen et al., 2002) did not find differences in cognitive decline between Mexican immigrants and US-born Mexican and non-Mexican Americans. In addition, Dallo, Kindratt and Zahone (2021) reported finding a higher prevalence of cognitive decline among Arab-American immigrants compared to their US-born and white counterparts. In contrast with the HIE, the number of years spent in the US also appears to be negatively associated with cognitive decline (more years=better cognitive functioning) (Gonzales et al., 2009). Several studies report findings indicating that Hispanics who spent more years as immigrants are less likely to have cognitive

decline compared to those who spent fewer years as immigrants (Garcia et al., 2018; Hill, Angel, and Balistreri, 2012; Weden et al., 2017). Recently, Moon et al. (2019) conducted a study that focused on the interaction of race and immigrant status on cognitive impairment. They found higher rates of dementia among white, Hispanic and other immigrants compared to their US-born counterparts but lower rates among black immigrants compared to their US-born counterparts.

In summary, to date, only a few researchers have used an intersectionality framework to assess the impact of race, gender and immigrant status on the cognitive health of older individuals. As well, studies that have used it to understand the effects of race/immigrant interactions on cognitive functioning in the Canadian context are non-existent. Yet, despite this, the empirical literature suggests that racial disparities may well intersect with those associated with gender and immigrant status, to influence cognitive health outcomes.

## **2.4 The Stress Process Model**

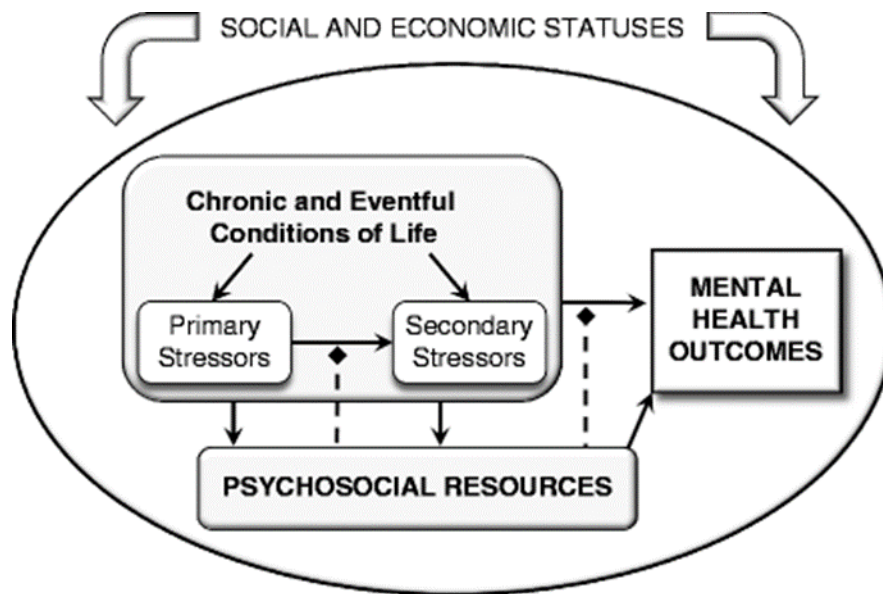
The Stress Process Model provides a useful theoretical perspective with which to examine how racial minority status in a society shapes cognitive and other health outcomes. The SPM continues to serve as one of the leading sociological paradigms in health research (Schieman and Koltai, 2017; Wheaton and Montazer, 2010). It was originally developed by Leonard J. Pearlin and colleagues (1981) to provide an understanding of the relationship between exposure to unemployment and other stressors and a multiplicity of health outcomes (both mental and physical) This model is still widely used by scholars (e.g., Brown, Mitchell and Ailshire, 2018; Gayman, Kail, Soring and Greenidge, 2018; Lee, Bierman and Penning, 2021; Witzel, Tuner and Hooker, 2022) to assess the health effects of stress exposure. However,

despite its widespread use, to my knowledge, it has yet to be drawn upon to address cognitive functioning in later life as a health outcome.

There are several versions of the SPM. Pearlin et al.'s (1981) initial conceptual model held that the social stress process had three primary components: the sources of stress, the mediators of stress, and the manifestations of stress. In this version of the model, it was acknowledged that the sources of social stress could be located in the structural and cultural conditions of societies. However, the model's primary focus was on individual-level experiences, with stress arising from "the occurrence of discrete events" such as unemployment, divorce or the death of a loved one as well as from "the presence of relatively continuous problems" (p.338) such as long-term poverty or chronic health conditions. The model also emphasized two main types of resources that could be used to alter the difficult conditions or lessen their impact: social support and coping.

Building on this original model, more recent versions have: directed explicit attention to the causal role of the social structural context of the stress process (i.e., the role of social and economic statuses); introduced a distinction between primary and secondary stressors (see Pearlin, 1989); and emphasized the importance of psychosocial resources, including social support and coping, as both mediators and moderators, in the stress process (Pearlin, 1999; Pearlin and Bierman, 2013). The main components of the SPM model are outlined in Figure 2.1.

**Figure 2.1. The Stress Process Model (Pearlin and Bierman, 2013, p. 326)**



### **Social and Economic Statuses**

The SPM suggests that the stress process has its origins in the social life of an individual within a stratified society (Pearlin and Bierman, 2013). Thus, from a sociological perspective, the social and economic circumstances in which stressful life events are rooted play a pivotal role in understanding the stress process. According to Pearlin, individual stressful experiences can usually be traced back to “social structures and people's locations within them.” He notes that “the structural contexts of people's lives are not extraneous to the stress process but are fundamental to that process. They are the sources of hardship and privilege, threat and security, conflict and harmony” (Pearlin, 1989; p. 242). The most important of these structures are the different systems of stratification – the social and economic statuses - that cut across societies. These include those based on such factors as race, gender, immigrant status, and age as well as social class. These in turn are said to affect all other aspects of the stress process. Therefore,

Pearlin (1991) viewed them as factors determining the type and extent of the stressors to which an individual will be exposed, how they respond to these stressors, and consequently, the stress outcomes an individual is likely to experience (Nagy et al., 2022; Yu et al., 2020; Pearlin, Mullan, Semple and Skaff, 1990). Consequently, not all individuals will experience stressors in the same way. Instead, this is likely to be determined by one's social status. Based on their ascribed or achieved status in society, people will experience different levels of exposure to various stressors and/or will be differently affected by them. In this way, the SPM acknowledges both differential exposure and differential vulnerability as part of the stress process (Brown, Mitchell and Ailshire, 2020).

Pearlin's work reflects a distinctly sociological view of race and other social status characteristics as reflections of structural locations within society that, in turn, influence all other components of the stress process, including individuals' exposure to various stressors, social resources and stress outcomes (Avison, 2009). This separates it from most analyses of the stress process which tend to view stress as a response to unusual circumstances. Instead, Pearlin turned his attention to the ordinary features of social life in which stress originates. For example, when resources and opportunities are distributed unequally based on race or gender, it can become a source of stress and give rise to other stressful life conditions like lower social status, financial inadequacy, and intrapsychic or psychological strains.

Pearlin's view is consistent with a view of race as socially constructed rather than as reflecting fundamental biological differences (Braveman and Dominguez, 2021). Reviewing several scientific definitions of race, Williams (2008) concluded that race as a biological classification has no scientific basis and instead, was created to exploit some groups who are considered to be minorities and inferior. Furthermore, Goodman (2016) states that when viewed

biologically, race is static (Brues, 1993; Gill, 2010) even though it is actually continuous, fluid (as it varies by time and place), and exhibits ‘within group’ variations (Cabrera, 2018; Templeton, 1998). Morning (2014) has suggested that racial categories must be viewed as the result of unequal power relations that have been established, resulting in their construction as biological categories. Some scholars (Hurtado, 2019; Mallon, 2018) have noted that race is constructed both individually (through historical racialized practises of dividing ourselves into groups) as well as structurally (through social institutions).

### **Primary and Secondary Stressors**

Stressors have been defined as “...the conditions, experiences, and activities that are problematic for people; that is, that threaten them, thwart their efforts, fatigue them, and defeat their dreams” (Pearlin, Mullan, Semple and Skaff, 1990, p.586). They include both primary and secondary stressors. Primary stressors are conceptualized as those that tend to occur first in people's experience. According to Pearlin, Menaghan, Lieberman and Mullan (1981), stressful life events (e.g., death of family member) and/or chronic strains (e.g., long-term poverty, chronic illness, discriminatory experiences, job pressures, marital and family conflicts) can serve as primary stressors.

According to the SPM, stressors do not necessarily emerge at the same time but rather, often occur sequentially. When primary stressors lead to the emergence of more stressors, the process is called stress proliferation and the new stressors are called secondary stressors. For example, discrimination, job insecurity or other strains experienced at a workplace (primary stressors) can result in secondary stressors, including intrapsychic or psychological strains (e.g., depression) which in turn can lead to consequent increases in adverse health outcomes.

## **Psychosocial Resources**

According to the SPM, the impact of exposure to various stressors (both primary and secondary) on health outcomes can also be influenced by individuals' psychosocial resources (An and Jang, 2016; Pearlin et al., 1981, 1990; Pearlin and Bierman, 2013). In Pearlin's work, these psychosocial resources generally include personal resources like mastery and self-esteem as well as social resources like social support.

In his earlier works, Pearlin presented these resources as 'mediators.' However, he also noted the ability of these resources to not only intervene in the relationship between exposure to various stressors and their outcomes but also, to influence the strength and direction of the relationship between them: "(t)hey are mediators in the sense that they have been shown to govern (or mediate) the effects of stressors on stress outcomes" (Pearlin, 1989: 249-250). In his later work (2013), however, he described them as 'moderators' as well. As mediators, when exposed to stressors, psychosocial resources serve as pathways through which various stressors influence health. As moderators, they might be able to increase or reduce stress outcomes as they can make an individual either more or less susceptible to the deleterious effects of stressors and hence increase or prevent negative health outcomes (Frazier and Brown, 2022).

According to the SPM, the extent to which psychosocial resources mediate and/or moderate the effect of stressors on an individual is also likely to vary by the social status or location of that individual (Pearlin, 1999). Thus, those who are advantaged with regard to racial, gender, or other social locations are not only less likely to be exposed to stressors (i.e., a differential exposure hypothesis) but more likely to possess psychosocial resources such as social support that tend to reduce the likelihood of negative health outcomes. Therefore, even if an individual is exposed to stressors, the psychosocial resources s/he possesses might be able to

serve as buffers, reducing their negative effects on health outcomes (i.e., a differential vulnerability hypothesis)(Alexander et al., 2017; Kaniasty and Norris, 1995).

### **Mental Health Outcomes**

Both Pearlin (1989, 1990) and others who have drawn on the SPM have tended to focus on stress as manifested in mental health outcomes such as anxiety and depression rather than lowered cognitive health or functioning. However, according to Pearlin, when external circumstances disrupt an individual's usual activities and affect internal functions, that dysfunction is referred to as stress (Pearlin and Bierman, 2012). It is the result of the individual's inability to cope with the external circumstances (stressors) due to his or her status in society (Pearlin and Bierman, 2012). Consequently, Pearlin et al. (1981) note that stress in turn "can be recognized as a generic term that subsumes a multiplicity of outcomes" (p.341)." Thus, he and other proponents of the SPM are critical of the tendency to limit the focus to only a few mental health outcomes, arguing that doing so "falls short of revealing fully the mental health effects of stressors, particularly since "different social groups often manifest the distress resulting from stressors in different ways" (Pearlin and Bierman, 2013, p. 335). Yet, basic cognitive skills have been recognized as an important component of mental health (Galderisi, Heinz, Kastrup, Beezhold and Sartorius, 2015; Manwell, Barbic, Roberts, Durisko, Lee, et al., 2015). Moreover, stress has been found to be a risk factor for cognitive decline (Agbenyikey et al. 2015).

## **2.5 The Stress Process Model and Racial Disparities in Mental Health and Cognitive Functioning: A Review of the Empirical Evidence**

### **Race and the Impact of Stressors on Mental Health**

Numerous studies have used the SPM to guide their assessments of the relationship between exposure to various stressors and mental health outcomes among older adults and other populations. For example, scholars have used the SPM to examine such things as the relationships between cyberbullying victimization and adolescent mental health (Wang, 2021), workplace bullying and race and gender differences in psychological distress (Attell, Brown and Treiber, 2017), adverse childhood experiences and adult mental health (Nurius, Green, Logan-Greene, and Borja, 2015), neighborhood environments (including violence, crime, disorder) and depression (Gilster, 2016), and access to health insurance and psychological distress among adults with a disability (Alang, McAlpine, and Henning-Smith, 2014).

In terms of racial disparities in exposure to stressors, several studies (Brown, Mitchell and Ailshire, 2020; Fox and Stallworth, 2005; Hayward et al., 2000; Roxburgh, 2009; Turner and Avison, 2003; Turner et al., 2017; Williams, 2018; Zhang et al., 2016) have documented the greater likelihood of black or African American and/or other racial minorities being exposed to various stressors (e.g., neighbourhood violence, crowding, crime, discrimination, lack of access to health care) than white Americans. For example, Sternthal et al. (2011a:b) studied adults of all ages in the US and report finding higher levels of exposure and co-occurrence of several stressors among blacks and American-born Hispanics compared to their white and foreign-born Hispanic counterparts in eight stress domains (including acute life events, employment, financial, life discrimination, job discrimination, relationship stressors, early life stressors, and community

stressors). With a focus on older adults specifically, Brown, Mitchell and Ailshire (2020) report findings indicating that older blacks and foreign-born Hispanics reported the highest levels of chronic stress exposure and were two to three times as likely as whites to experience financial and housing-related stress.

In terms of secondary stressors, several studies (e.g., Cummings et al., 2008; Liang et al., 2010) have reported that racial minorities tend to rate their health (SRH) as poorer compared to whites. For instance, Evandrou et al. (2015) found that older adults from racial minority groups like blacks and South Asians reported poorer SRH compared to whites. Research (e.g., Bell et al., 2018; Do et al., 2008) has also shown that factors such as low income levels contribute to black-white disparities in SRH. Similar trends have been observed in self-rated mental health (SRMH), with racial minorities more often reporting fair/poor SRMH compared to whites. For example, Kim et al. (2011) found that among older adults, Asians rated their SRMH the poorest, followed by Hispanics and blacks. In a similar study by Kim et al. (2014), blacks and Asians reported poorer SRMH compared to whites and Hispanics. A more recent study by Santos-Lozada (2016) found that Hispanics were less likely to rate their mental health as poor/fair compared to Whites, though this study did not focus on older adults. Additionally, various studies (e.g., Verkuyten, 2008) have found that racial minorities report lower life satisfaction compared to whites. For example, Skarupski et al. (2013) found that older African Americans reported lower life satisfaction compared to their white counterparts, which has been attributed to the lack of social resources often available to racial minority groups. Lastly, racial differences in depressive symptoms have been documented in several studies (e.g., Barry et al., 2014). For instance, in a longitudinal study, Skarupski et al. (2005) found that older blacks experienced more depressive symptoms both at baseline and in follow-ups compared to whites. A more recent study by Vyas

et al. (2020) on later-life depression found that older black, Hispanic, and Asian older adults experienced more depressive symptoms compared to white older adults, which they attributed to disparities in income and lack of physical activity.

Overall, these studies highlight significant disparities in SRH, SRMH, life satisfaction, and depression between racial minorities and whites, driven at least in part by disparities in SES. There is also evidence supporting the mediating effects of differential exposure to stressors on racial disparities in mental health. Citing evidence obtained from numerous studies (e.g., Avison et al., 2009; Lorenz et al., 1997; Seeman and Crimmins, 2001; Turner, 2003; Turner and Avison, 2003; Turner et al., 1995; Turner and Lloyd, 1999), Thoits (2010) concludes that differential exposure to stressful experiences is a primary way that racial-ethnic and other inequalities in mental health are produced. Supporting this conclusion, Sternthal et al. (2011a:b) report finding support for the differential exposure hypothesis as racial differences in health outcomes, including mental health outcomes (i.e., self-reported mental health, depression), for blacks and American-born Hispanics were mediated by differences in stress exposure (with financial and relationship stressors having the largest and most consistent effects).

The relevance of differential exposure to various stressors in accounting for racial disparities in mental health during the later years of life is somewhat less studied. However, focusing on middle-aged and older adults, Brown et al. (2020) report findings indicating that middle-aged and older black and Hispanic adults in the US reported higher levels of chronic stress than whites across various domains (i.e., health, financial, residential, relationships, and caregiving strain). As well, George and Lynch (2003) studied black-white differences in the relationship between exposure to acute stressors and mental health (depression) among older adults in the US and found evidence that acute stressors had a greater impact on the mental

health outcomes of blacks than whites, a finding they assert supports the differential exposure to stressors hypothesis. Stress levels increased in a consistent manner over time for blacks, but this was not the case for whites, except for the eldest age group (80 and older). Similarly, Umberson and Donnelly (2022) found that older (aged 51 and older) black and U.S.-born Hispanic parents experienced greater psychological distress than whites following the death of a child, noting that this was due to the additive effects of their greater exposure to bereavement and their higher distress levels regardless of bereavement status.

It has been suggested that, in addition to the negative implications of their greater exposure to stress, individuals who are socially disadvantaged may also be more vulnerable to the negative consequences of exposure (Kessler, 1979a, 1979b). It is evident that social status factors can influence how individuals respond to various stressors. However, the evidence regarding whether non-whites are more vulnerable than whites and experience more adverse effects from their exposure to different stressors remains inconclusive. Several earlier studies (e.g., Kessler, 1979a; Ruef, Litz and Schlenger, 2000; Ulbrich et al., 1989; Ulbrich, Warheit, and Zimmerman, 1989) suggested that blacks and Hispanics appeared to be more vulnerable to undesirable life events (e.g., the death of family members) than whites while whites appeared to be more vulnerable to financial problems. Conversely, a more recent study (Adkins et al., 2009) suggested that blacks are likely to be more vulnerable to stressors like economic hardship compared to their white counterparts, revealing higher levels of depression as a result. Similarly, in their longitudinal study of older parents (aged 51 years and older), Umberson and Donnelly (2022) found that foreign-born Hispanic immigrants to the US were more vulnerable to the stress associated with the death of a child compared to black, US born Hispanic and white parents.

In contrast, however, both Sternthal et al. (2011) and Assari and Lankarani (2015) found little support for the view that black and/or Hispanic adults (aged 18 years or older) are more vulnerable to negative life events (including financial issues, health issues, racial discrimination, victimization, family problems) compared to whites in their sample. Moreover, McLaughlin et al. (2019) found little evidence of differential vulnerability to mental disorders after being exposed to traumatic events among racial minority group members compared to whites. Conversely, in a study of adults aged 52 and older, Brown et al. (2020) found that racial/ethnic minorities, including blacks and Hispanics, were in fact less likely than whites to be vulnerable to stressful events or chronic stressors even though they were exposed to a greater number of stressors compared to whites. Additionally, Kahn and Pearlin (2006) found that the negative impact of economic hardship on self-rated health, functional impairment, and depression was more pronounced for whites compared to African Americans in their study focusing on older adults.

The lesser vulnerability of racial minorities, including older adults, to traumatic events resulting in mental disorders in the US has been explained in terms of their routine encounters with discrimination (Chou, Asnaani and Hofmann, 2012; Polanco-Roman, Danies and Anglin, 2016) based on the view that their daily experiences of stigma and systemic oppression are likely to lead to a psychological preparedness for adversities (Hatzenbuehler et al., 2013; Lewis et al., 2015; Williams et al., 2004). Indeed, a review of research investigating the differential vulnerability of racial minorities to various stressors during later life reveals a consistent pattern: black older adults tend to appraise stressors as less upsetting compared to white older adults. In a similar study by Brown et al. (2020), the researchers explored whether racial differences in experiencing chronic stressors and their perceived stress could account for disparities in anxiety and depressive symptoms between black and white older adults. Once again, the results

supported the argument that black older adults appraised chronic stressors as less upsetting. These findings underscore the differential responses to stress among racial groups during the later stages of life.

### **Race and the Impact of Stressors on Cognitive Functioning**

With regard to cognitive functioning outcomes, there is substantial evidence that exposure to various stressors can affect cognitive health. Negative daily life events can have adverse effects on memory (Neupert, Almeida, Mroczek, and Spiro, 2006; Stawski, Mogle, and Sliwinski, 2011). As well, role-related stressors like caregiving can result in lower cognitive functioning in later life (Takai et al., 2009). Furthermore, the negative impact of chronic strains (such as long-term medical conditions) on cognitive functioning has been documented in several studies (Aggarwal et al., 2013; Feeney et al., 2018; Muonoz et al., 2015). Researchers such as Kim et al. (2013) have explored the role of lower income as a stressor, finding that chronic exposure to stressors like childhood poverty can affect cognitive functioning in adulthood. Workplace stressors, particularly chronic job strain and low control in the workplace during middle adulthood, have also been associated with a higher risk of cognitive impairment in later life, as observed in studies conducted by Andel, Crowe, Kareholt, Wastesson, and Parker (2011) and Linden, Keijsers, Eling, and Schaijk (2005). These findings highlight the various stressors that can potentially impact cognitive functioning.

In recent decades, differences in exposure to stress has garnered significant attention as a potential link between race and cognitive decline. For example, Letang et al. (2021) found evidence for the mediating effect of perceived stress on racial differences in cognition among

blacks compared to whites as well as Hispanics compared to whites in young adulthood. In a noteworthy cross-sectional study, Chen et al. (2022) examined the cumulative impact of stressors experienced throughout the lifespan, specifically assessing 10 domains of acute and chronic stress. Their findings revealed that such cumulative exposure to stressors partially explained the disparities in cognitive functioning between black and white individuals in a sample of middle-aged and older adults. Similarly, Zuelsdorff et al. (2020) observed that cumulative exposure to stressful life events (including parental alcohol abuse, involuntary job loss, the loss of a child) accounted for the differences in three domains of cognitive functioning (including episodic memory and two domains of executive functioning) between African American and white individuals over time in a sample of middle-aged and older adults. They note that greater lifetime stress experienced by African American adults predicted their poorer cognition in later life. Also with a focus on the later years of life, Aggarwal et al. (2013) conducted a seven-year follow-up study and demonstrated that perceived stress among older African Americans was associated with lower cognitive functioning in later life and a faster rate of cognitive decline compared to their white counterparts. Similarly, in a longitudinal study focusing on black older adults without cognitive impairment at baseline, Turner et al. (2017) found that those who reported higher levels of perceived stress experienced more rapid cognitive decline over time. Overall, these studies shed light on the potential role of exposure to stressors in contributing to racial disparities in cognitive functioning.

Some studies also found evidence supporting the differential vulnerability to stressors in terms of lower cognitive functioning across racial groups. Prior research suggested that blacks are more vulnerable to negative health outcomes but recent studies indicate that blacks actually perceive stressors as less distressing than whites (Brown et al., 2020). For example, in a

longitudinal study, Morris et al. (2022) found that at baseline, black older adults showed worse performance on cognitive tests in the memory domain compared to white older adults. This disparity was partially explained by stress exposure but was counteracted when accounting for stress appraisal, as black older adults perceived stressors as less upsetting. Further, Sheffler, Moxley, and Sachs-Ericsson (2014) found that at lower stress levels, white individuals were less vulnerable to cognitive decline than African Americans, but as stress increased, whites exhibited similar levels of vulnerability.

### **Socioeconomic Status as a Primary Stressor**

Pearlin, in his discussions of the SPM, conceptualized social and economic statuses as background factors influencing both exposure to and the impact of both stressors and resources on stress-related outcomes (Pearlin and Bierman, 2013). This, in turn, has often led to the use of various socioeconomic status indicators – including education, income levels, and wealth - as proxies for the background factors that are said to affect the entire stress process. Yet, Pearlin (1989) also drew a distinction between people’s social class or social structural backgrounds and the socioeconomic and other stressors often encountered as a result. For example, on the one hand he noted that “(m)any stressful experiences ... can be traced back to surrounding social structures and people's locations within them. The most encompassing of these structures are the various systems of stratification that cut across societies, such as those based on social and economic class, race and ethnicity, gender, and age” (p.242). On the other, he also noted that these factors can lead to economic and social strain: “Among the stressors closely linked to status and status attainment are ... enduring economic strain and discriminatory experiences” (Pearlin et al., 2005, p.205). Further, “(t)he stressors that are of special interest to research into the stress process are those that are related both to people’s social and economic status and to

indicators of their health” (Pearlin, 2010, p. 208). Consequently, if we consider other social status locations such as race or gender or social class, as antecedents that impact the entire stress process, it is crucial to acknowledge that lower socioeconomic status components, such as lower education, lower income levels, and a lack of home ownership, can also be conceptualized as primary stressors and therefore, as significant generators of stress-related outcomes.<sup>4</sup>

Individuals who belong to racial, gender, and other minorities often find themselves in marginalized or disadvantaged positions within the social stratification system. These socially ascribed social statuses significantly influence and interact with socioeconomic indicators, effectively transforming them into stressors (Pearlin et al., 2005). Consequently, they can obstruct individuals from achieving higher SES levels, including education and increased income. For example, studies have consistently shown that racial disparities endure into early adulthood, with black individuals, as members of racial minority communities, experiencing lower educational attainment, reduced income, and a substantial wealth disparity when compared to their white counterparts (due to such factors as discrimination and segregation into poorer neighborhoods, etc.). As noted by Pearlin (1989), for example, “living in or close to poverty ... are among the ambient strains that cut across roles and envelop people” (p. 246). He also notes that “(a)mong the array of chronic stressors that people may confront in their daily lives, there is probably none more pivotal than economic hardships and strains” (Kahn and Pearlin, 2006, p.18).

Several studies provide evidence linking lower SES as a stressor that increases the physiological and subjective levels of stress people experience. For example, Cohen, Doyle and

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<sup>4</sup> When social class is considered a background factor, it affects education, household income and home ownership.

Baum (2006) examined the association between SES (i.e., education, income) and the levels of two stress hormones (cortisol and catecholamine) among adult men and women. Their study found that lower SES increased the level of these stress hormones in the human body. In another study, men and women (aged 20-45) were divided into lower SES and higher SES groups (based on years of education, average household income, occupational status, and property ownership), with perceived stress as well as cortisol levels used to assess their stress levels. Compared to the higher SES group, the lower SES group demonstrated higher perceived stress and higher cortisol levels (Garcia et al., 2008). Finally, a more recent longitudinal study (Lê-Scherban et al., 2018) found that, when compared to those with higher SES, older adults with lower SES (based on education, income, wealth) showed lower cortisol recovery in a laboratory setting when exposed to acute stressors (i.e., a physiologic challenge like standing quietly). When exposed to such stressors, their cortisol levels increased but then recovered, going down to their baseline levels. It was concluded that the slower recovery rate evident among the lower SES participants was the result of cumulative exposure to stressors over the life course.

Lower socioeconomic status has consistently been associated with negative mental health outcomes, primarily due to the cumulative stress experienced over the course of an individual's life. This cumulative effect of stressors on mental health has been demonstrated in a study conducted by Myers et al. (2015). Their research focused on a sample of 500 African American and Latino adults with a history of mental illnesses such as anxiety, depression, and post-traumatic stress disorder. The findings revealed that these individuals reported cumulative exposure to various stressors, which significantly contributed to their negative mental health outcomes. Similarly, Hudson (2005) conducted a study of adults and found that those with lower SES, determined by factors such as education, income, and occupational status, exhibited higher

rates of mental illness. This relationship was explained by the individuals' greater exposure to economic strain, further emphasizing the impact of socioeconomic factors on mental health.

Additionally, lower socioeconomic status has also been linked to cognitive decline. For example, Steptoe and Zaninotto (2020) found that lower SES (wealth) was a determinant of the rate of decline over eight years in cognitive performance (memory, executive function, and processing speed), as well as several other health domains (including physical capability, sensory function, physiological function, and emotional well-being) in a sample of individuals with an average age of 64 (at baseline). Further, a longitudinal study by Zeng et al. (2022) of older adults found that SES in adulthood, defined by education and occupation, was a more significant determinant of cognitive performance than childhood circumstances, with the strongest effects observed among black respondents. Lower SES was found to be associated with negative changes in all domains even after controlling for relevant covariates. Similarly, a longitudinal study by Simons et al. (2023) examined the extent to which two consequences of racism—low SES and discrimination—predicted self-reported cognitive decline 19 years later. Focusing on a sample of middle-aged and older African American women, their research revealed a significant relationship between lower SES (based on education and income) and cognitive decline; a relationship that was also mediated by exposure to other race-related stressors, including discrimination and chronic illness onset.

## **Education**

Lower education has been identified as a significant indicator of lower SES in a number of studies (Sachs-Ericsson and Blazer, 2005; Vásquez, Botosaneanu, Bennett, and Shaw, 2016). As such, it can also be viewed as a primary source of stress that also increases one's exposure to other stressors. For example, Lunau, Siegrist, Dragano and Wahrendorf (2015) found that those

with lower education had more stressful jobs compared to those with higher education among men and women aged 50 to 64 years. Lower education levels can prevent people from acquiring higher social status through better occupations and incomes which, in turn, can increase their exposure to stressful living environments, and so on (Baum, Garofalo and Yali, 1999). People with lower education have been found to be more likely to be exposed to stressful settings like neighborhoods with violence, hazards, discrimination, lower access to health care facilities and lower level of social support (Baum, Garofalo and Yali, 1999; Wight et al., 2006).

To date, a number of studies have examined the association between education and stress levels. One study by Fiocco, Jooper and Lupien (2007) found that adults aged 50-65 years with lower education showed greater stress responses compared to those with higher education. Researchers have also linked education to mental health outcomes, indicating that individuals with lower levels of education tend to report higher levels of psychological distress (Grzywacz et al., 2004). Moreover, Niyemer et al. (2019) found evidence for the mediating effect of stressors on the relationship between education and mental health. Their study, conducted with a sample of German adults, revealed that individuals with lower educational attainment were more likely to report depressive symptoms, and this association was mediated by the presence of daily stressors (e.g., financial difficulties, problems at work) and a lack of psychosocial resources, such as a sense of control.

It has been noted that living in low education areas exposes individuals to other chronic stressors like limited income, resulting in restricted access to essential physical and social resources, and hindering engagement in activities associated with better cognitive functioning (Seeman et al., 2011; Weuve et al., 2004). In fact, a number of studies have linked education to cognitive functioning and decline (Beydoun et al., 2014). Most report findings linking higher

education to better cognitive functioning and lower levels and/or rates of decline. This includes both cross-sectional and longitudinal studies. For example, in a sample of adults aged 70 years or older, Cagney and Lauderdale (2002) found that early life education had a significant effect on cognitive performance in later life independent of economic status. Similarly, in another study, Lee, Kawachi, Berkman and Grodstein (2003) examined the relationship between educational attainment and cognitive function and decline among community-dwelling women nurses aged 70-79 years. They found that women who had a university nursing degree had better baseline scores and were less likely to experience cognitive decline compared to those who had received a nursing diploma. A nine-year longitudinal study among Chinese older adults (aged 65 to 105 years) found that those with higher educational attainment performed better on cognitive tests at baseline compared to those with lower educational attainment. However, the study did not find any effect of educational attainment on cognitive decline over time (Yang, Martikainen, Silventoinen and Konttinen, 2016). Conversely, a more recent longitudinal study (Clouston et al., 2020) conducted among US residents in their mid-sixties found an association between higher education and higher cognitive functioning at baseline as well as a lower risk of subsequent cognitive decline over an 18-year period (from 1994 to 2012).

Racial disparities in cognitive functioning and dementia rates have also been linked to differences in education. In a cross-sectional study, Schwartz et al. (2004) found that, after controlling for education and other SES indicators, racial gaps in cognitive test scores among middle-aged and older African-American and white adults were reduced by around 26%. Similarly, in a Canadian study of middle-aged and older adults, Haq and Penning (2020) reported finding that the racial gap (white vs non-white) in cognitive functioning was reduced but not eliminated when education was taken into account. With a focus on dementia as an outcome,

Gurland and colleagues (1999) found that racial disparities between older whites and non-whites (African-Americans and Latinos) operated through disparities in age and levels of education. Similarly, Garcia et al. (2018) found that when controlling for years of education, the higher risks of CIND and dementia among older blacks and US-born Hispanics in comparison to whites were reduced while the higher risks evident among foreign-born Hispanics in comparison to whites were no longer significant.

Somewhat similar findings emerge from longitudinal studies. Zhang, Hayward and Yu (2016) found that the lower levels of education evident among blacks compared to their white counterparts contributed to the black-white racial gap in the onset of cognitive impairment over a twelve year period in later life among adults aged 65 and over at baseline. Additionally, Farina et al. (2020) reported finding that education played an important role in explaining the racial gap in dementia between blacks and whites. Overall, these findings show that racial disparities in cognitive functioning in later life may be attributable to a large extent to racial gaps in education.

While researchers have tended to focus on the role of education as a mediator of racial disparities in cognitive functioning, there is also some evidence suggesting that racial groups differ in their vulnerability to the effects of lower levels of education. For example, several US studies report findings suggesting that blacks derive greater cognitive benefit from higher education than whites; thus, the racial disparity in cognitive functioning diminishes at higher levels of education (Barnes et al., 2012; Díaz-Venegas et al., 2016; Farina et al., 2020; Jean et al., 2019; Sherman-Wilkins and Thierry, 2019; Weuve et al., 2018). Yet, this may not be the case with regard to other racial minorities. According to Díaz-Venegas et al. (2016), for example, while cognitive functioning scores increased with greater educational attainment in all racial/ethnic groups, Hispanics experienced the least benefit. In a longitudinal study conducted

by Chen and Zissimopoulos (2018), it was observed that educational attainment over a 12-year period significantly reduced the odds of cognitive decline among blacks and whites by 25%. However, for Hispanics, the reduction in odds was only 8%. Similarly, Makkar et al. (2020) conducted a longitudinal study and found that lower educational attainment (incomplete elementary education) was associated with a significant risk of cognitive impairment among both Asians and whites. Notably, the completion of high school over time had a stronger impact in lowering the risk of cognitive impairment for Asians compared to whites. More recently, Hale et al. (2022) drew on the HRS, a nationally representative longitudinal survey of U.S. residents aged 50 and older and their spouses to address intersections involving race, gender, and educational attainment on cognitive status (i.e., no cognitive impairment, cognitive impairment-no dementia, and dementia). They discovered that black and Latino women were more likely to experience cognitive impairment, with lower education adversely affecting their cognitive health more (i.e., demonstrating cumulative disadvantage), when compared to black and Latino men as well as white women and men. In contrast, white men were noted to be the most likely to experience cumulative advantage, benefitting more from their education than did their black and Latino counterparts.

### **Economic Hardship**

Economic hardship has been considered one of the most important stressors which can have a deleterious effect on mental health and other health-related outcomes in later life. Several studies have shown that wealth can keep older adults free of income-related stress (Kahn and Pearlin, 2006; Lynch, Kaplan, and Shema, 1997; Zheng et al., 2016). According to Kahn and Pearlin (2006), it does so in part through its impact on “allostatic load” – the cumulative burden or effect of chronic stressors experienced over the life course that damage health (Guidi, Lucente,

Sonino and Fava, 2020). Along similar lines, Baum, Garofalo and Yali (2006) showed how low income can be a chronic stressor and also lead to other stressors (e.g., discrimination, lower access to health care).

To date, research addressing the implications of economic hardship have focused their attention on mental health outcomes such as depression and anxiety (Ding et al., 2020; Ladin, Daniels and Kawachi, 2010; Pabayo, Dunn and Gilman, 2016; Ridley et al., 2020). For instance, Choi and McDougall (2009) found a higher prevalence of depressive symptoms among older adults with low incomes when compared to their higher-income counterparts. Additionally, Kiley et al. (2015) conducted a longitudinal study which demonstrated how individuals with low income levels faced an increased risk of developing mental illnesses such as anxiety disorders over time.

Research addressing the relationship between economic hardship and cognitive functioning suggests that cognitive health may be contingent on income levels and other income-related measures such as home ownership (Goveas et al., 2016), self-reported financial inadequacy and net household wealth (Zhang et al., 2016). Cross-sectional studies tend to report findings indicating that wealth and/or income are associated with cognitive functioning in older adults. For example, in a study conducted by Lee et al. (2006) on a sample of middle-aged and older adults, it was observed that individuals with the lowest incomes had a two times higher risk of cognitive impairment compared to those with the highest incomes. Similarly, a study by Gilmore (2011) found that Canadian older adults who scored low on cognitive tests were more likely to belong to low-income groups compared to those who scored high, showing a positive relationship between income and cognitive functioning. Further, according to findings reported by Peterson et al. (2019), individuals aged 45 and older with a household income level below \$10,000 per year were 4.7 times more likely to report subjective cognitive decline compared to

those with a household income exceeding \$75,000 per year. They also reported that individuals who were in rental or alternative living arrangements had a 1.2-fold higher likelihood of reporting subjective cognitive decline compared to those who owned a home.

Longitudinal studies, including the works of Lynch et al. (2000) and Lou and Waite (2005), have consistently shown that economic hardship has a significant impact on cognitive functioning throughout one's life. In their study, Lynch et al. (1999) found that participants who experienced economic hardship over the life course had greater odd of difficulties in cognitive functioning compared to those with no history of economic hardship. Another longitudinal study conducted by Lou and Waite (2005) on a sample of individuals aged 50 years or older revealed that household income had a significant impact on cognitive functioning. The study demonstrated that higher income was associated with better performance on cognitive tests. Moreover, an 18-year longitudinal study conducted by Chiao, Botticello and Fuh (2014) revealed that older adults with low incomes experienced a more rapid cognitive decline compared to those with higher incomes. However, longitudinal findings reported by Lee, Kawachi, Berkman and Grodstein (2003) did not show any relationship between income and cognitive decline among older women once education and other covariates were controlled for.

In some studies, racial disparities in cognitive functioning and dementia rates have been found to originate in differences in income or other economic well-being indicators. For example, in a Canadian study, Haq and Penning (2019) found that differences in income levels served as one of the mechanisms that explained white versus non-white differences in cognitive functioning in later life. Similarly, Zahodne et al. (2017) report finding that income was second only to education as a mediator of racial (non-Hispanic black vs white) disparities in cognition among adults in the US. In addition, Yaffe et al. (2013) observed that SES (including perceived

economic hardship and income as well as education) accounted substantially for black-white racial disparities in the incidence of dementia. Similar results were obtained by Koster et al. (2005). However, in a recent longitudinal study, Gleib, Lee and Weinstein (2022) found that income did not have a big impact on racial disparities in cognitive abilities, contributing only a small percentage (1%-5%) to black-white differences in cognition. However, the amount of money and assets a person had become more important as they got older. Thus, in older age, wealth (including home ownership) may play a larger role in explaining why there are differences in cognitive abilities between black and white individuals in later life.

While research attention has primarily focused on the mediating effects of economic conditions on racial disparities in cognitive functioning to address the differential exposure hypothesis, there is also some evidence suggesting that the effects of economic conditions on cognition may differ by race (as suggested by a differential vulnerability hypothesis). For example, some research findings suggest that the cognitive benefits of greater income and/or wealth may be limited to whites (Cagney and Lauderdale, 2002; Peterson et al., 2021). Cagney and Lauderdale (2002) report finding that the moderating effect of wealth and income on cognitive performance was observed primarily among white older adults; yet it was not evident among black and Latino individuals. Similarly, Peterson et al. (2021) report finding that the impact of income and assets on cognitive functioning were moderated by race, with both factors associated with cognition for whites but not blacks.

### **Secondary Stressors**

The SPM also directs attention to the role of secondary stressors that emerge or follow from exposure to primary stressors and that can sometimes have more deleterious effects on mental health and other health outcomes than the original primary stressor. As Pearlin et al.

(1990) noted, “the primary stressors are likely to be both durable and intensified over time. These conditions are productive of other stressors, those we call secondary” (p. 588). Among other things, these secondary stressors include what Pearlin et al. refer to as intrapsychic or psychological strains. A review of the literature suggests several intrapsychic or psychological strains that may be important to consider when focusing on racial disparities in cognitive functioning associated with SES. They include such things as poor self-rated physical and mental health, low life satisfaction and depressive symptoms.

Numerous studies have demonstrated that each of these factors can induce stress and contribute to negative health outcomes. For example, Dahlgren, Kecklund, Theorell and Akerstedt (2009) examined the association between self-rated poor health and level of cortisol (stress) among office workers. The study showed poor self-rated health was associated with high cortisol levels. In addition, life satisfaction and level of stress, as tested by cortisol level, has been found to be related such that people with lower life satisfaction reported higher momentary cortisol level in a study that was conducted six times a day for three consecutive days (Smyth, Zawadzki, Juth and Sciamanna, 2017). Finally, older adults with depressive symptoms exhibited higher cortisol levels at a certain point in time (10 pm- cortisol levels were tested 3 times a day) compared to healthy young adults and older controls in a study by Balardin, Vedana, Luz and Bromberg (2011).

Self-rated overall (SRH) and mental health (SRMH) can also be considered secondary stressors. To date, numerous studies have reported that primary stressors, including lower SES indicators like lack of education, income, wealth and/or home ownership, have a negative impact on SRH and SRMH (e.g., Singh-Manoux, Marmot, and Adler, 2005; Wolff et al., 2010), including among middle-aged and older adults (Kahn and Pearlin, 2006; Kim et al., 2021;

Marshall and Tucker-Seeley, 2018; Schöllgen et al., 2010; Wen, Hawkey and Cacioppo, 2006). For instance, based on retrospective data analysis, Kahn and Pearlin (2006) found that persistent financial difficulties faced over the life course were negatively associated with self-reported health among adults aged 65 and over. Further, in a study conducted by Schöllgen, Huxhold, and Tesch-Römer (2010), it was found that there was a significant trend toward increasing rates of poor perceived health among younger and middle-aged groups as income decreased. However, this trend was not observed in the oldest age group (70–85 years old), which suggests that the association between income and subjective health also varies across different age groups.

Several longitudinal studies also highlight the substantial influence of SES disparities on self-rated health outcomes. For example, Orpana, Lemyre, and Kelly (2007) provide evidence that people who earned less than \$20,000 annually had nearly triple the likelihood of reporting poor subjective health over a period of two years compared to individuals in the highest income group. Somewhat similar findings are reported by Coustaury et al. (2023) in a study of adults aged 50 and older based on eight waves of panel data from the English Longitudinal Study of Aging. Finally, in a 3-year longitudinal study addressing the effects of education on changes in SRH among adults aged 50 and older, Verropoulou (2012) revealed that completing post-secondary education had a strong protective effect on SRH, reducing the probability of experiencing a decline in subjective health over time.

Furthermore, cross-sectional and longitudinal studies have also established a positive association between self-rated poor or fair health (both overall and mental) and cognitive decline, as well as the development of dementia in older age (Montlahuc et al, 2011). For example, Hultsch, Hammer and Small (1993) reported finding that performance on multiple cognitive measures among older adults was associated with individual differences in SRH. More recently,

Kato et al. (2013), in a cross-sectional study, showed a positive association between SRH and cognitive functioning in later life in a Jewish community. Moreover, in a 10-year follow-up study conducted by Bond et al. (2006) among a sample of older adults, it was observed that individuals who previously rated their health as excellent had a 50% lower risk of developing cognitive impairment compared to those who rated their health as good. Conversely, those who rated their health as fair had a 70% higher risk, and those who rated their health as poor had a 170% higher risk of subsequently developing cognitive impairment. Similarly, in a more recent longitudinal study, Bendayan et al. (2017) found that older adults who rated their health as poor at baseline showed faster cognitive decline compared to those who rated their health as excellent, very good or good (also see Aschwanden et al., 2020). A similar 5-year follow-up study found SRH to be a strong predictor of dementia among older adults (John and Montgomery, 2013). Regarding SRMH, a study by Goda et al. (2020) found that poor subjective mental health was associated with increased subjective cognitive decline among older adults in Japan. Further, in a longitudinal study, Jang et al. (2020) showed a positive relationship between poor self-rated mental health and self-rated cognitive health in a sample of 2061 older immigrants in the USA.

Life satisfaction (LS) is another secondary psychosocial stressor that may affect cognitive functioning and decline. Several studies report a positive relationship between SES indicators and life satisfaction. For example, a meta-analysis of 56 studies by Howell and Howell (2008) concluded that socioeconomic status is positively associated with life satisfaction. A meta-analysis of 205 studies reports similar findings among older adults (Pinquart and Sorensen, 2000). More recent studies also report finding a positive relationship between life satisfaction and socioeconomic indicators in older adulthood (e.g., Niedzwiedz, Katikireddi, Pell, and Mitchell, 2014; Read, Grundy, and Foverskov, 2016). For example, Moreno-Agostino (2021)

showed how SES (education, income) directly affects life satisfaction in a sample of middle-aged and older adults (aged 50+) in Europe.

To date, however, findings regarding the impact of life satisfaction on cognitive functioning appear contradictory. On the one hand, cross-sectional studies have documented lower life satisfaction among older adults diagnosed with CIND and dementia than those with normal cognition (St. John and Montgomery, 2010). Similarly, in a longitudinal study, Peitsch, Tyas, Menec and St. John (2016) found that cognitively intact older adults with lower life satisfaction at baseline showed greater symptoms of cognitive decline five years later. The authors described the association as bidirectional, suggesting that those with lower LS may not be interested in cognitively stimulating activities, resulting in lower cognitive functioning whereas those who experience lower cognitive functioning may experience lower LS. However, another four-year longitudinal study (Kim et al., 2021) was unable to find any association between life satisfaction and cognitive impairment among 12,998 individuals over the age of 50 using the US Health and Retirement Study. To my knowledge, research has yet to examine its role in mediating relationships between income or other more objective indicators of SES and cognitive functioning in middle or later life.

Finally, depression may be another secondary psychological stressor impacting the onset of cognitive decline. Several studies have found a positive relationship between SES and depression. For example, a 2003 meta-analysis showed that low SES slightly increased the risk of depressive episodes and moderately increased the risk of persistence of depression in the population as a whole (Lorant et al., 2003). In a more recent cross-sectional study, Freeman et al. (2016) showed that lower education was associated with an increased risk of depression among participants aged 18 and older in Spain, Finland and Poland. Similar findings have been reported

in cross-sectional studies focusing on older adults. For example, a study of participants aged 60 or older in China (Xue et al., 2021) revealed that higher education and income levels were associated with a decreased risk of depression. Similar findings are reported by Domenech-Abella et al. (2018) with regard to older adults in Poland, Spain and Finland. Similar trends are evident in longitudinal studies. In a ten-year longitudinal study, Lorant et al. (2007) found a relationship between lower SES and depression using the Belgian Households Panel Survey dataset that includes participants aged 16 or over. More recently, Luo et al. (2023) used panel data from 12 waves of the Health and Retirement Study of adults aged 51–90 in the U.S. to examine age trajectories of depression in middle and later life. They found that individuals with a high school diploma or less education reported more depressive symptoms at all ages than individuals with a college degree or more. For most age cohorts, the mental health gap by education remained stable with age in later life.

As well, although contradictory findings are evident (e.g., Huang et al., 2011), numerous studies have found a significant relationship between depression and cognitive impairment. For example, Wei et al. (2019) report cross-sectional findings indicating an inverse association between late-life depression and cognitive function (including memory, executive function/processing speed, and language) in a representative sample of older adults in the U.S. In their meta-analysis, Rock et al. (2014) report finding significant moderate cognitive deficits in memory, executive function, and attention in patients with depression relative to controls. Similarly, Vermeulen et al.'s (2019) systematic review and meta-analysis of studies of cognitive functioning in older adults (aged 55+) found that those with psychotic depression (a major depressive disorder with psychotic features) showed significantly poorer performance on overall cognitive functioning as well as on nearly all separate cognitive domains (i.e., memory,

executive functioning, attention, but not verbal fluency) compared to those with non-psychotic depression.

A link between depression and dementia has also been reported (Barnes et al., 2012; Green et al., 2003; Huang et al., 2011; Muahammad and Meher, 2021). According to Richard et al. (2012), even though there is an association between depression and cognitive functioning, there is no proof that depression leads to dementia. Instead, they claim that late life depression might just accompany dementia. Yet, according to Mourao et al.'s (2016) meta-analysis of studies examining the risk of dementia among individuals with MCI and depressive symptoms compared with individuals with MCI but no depressive symptoms, depressive symptoms serve as risk factor for progression to dementia in those with MCI.

Further, longitudinal studies also report findings suggesting a causal impact. For example, in a three-year longitudinal study that included a sample of adults aged 65 years and above in the U.S., Sachs-Ericsson, Plant and Blazer (2005) found that participants with depression were at a higher risk of subsequent cognitive decline. Depression has also been found to be associated with MCI in a 6-year longitudinal study (Barnes et al., 2006). In this study, participants aged 65 years or above with moderate or high depressive symptoms at baseline were found to be more likely to develop MCI during follow-up compared to those without symptoms or with fewer symptoms at baseline. Similar results are reported by Donovan et al. (2017) based on a study of individuals aged 65 and older who participated in the US Health and Retirement Study from 1998 to 2010. In a recent study by Zhu et al. (2023) focusing on older adults in the USA and UK, it was found that persistent, long-term depressive symptoms were linked to accelerated cognitive decline and an elevated risk of developing dementia.

Finally, recent evidence shows that depressive symptoms are also important in mediating relationships between objective SES indicators like income and both CIND and dementia. Zhou et al. (2021) report findings indicating that associations between cognition and three different wealth indicators were significantly mediated by depression, with depression accounting for 29.70% of the association between debt and cognition, 11.83% of the association between poverty and cognition, and 25.34% of the association between debt, poverty, and cognition.

### **Social Resources as Stress Mediators and Moderators**

According to the SPM, the impact of exposure to various (primary and secondary) stressors stemming from racial and other structural inequalities can be mediated and/or moderated by social resources, thereby influencing cognitive functioning and other health outcomes (Aneshensel, Pearlin, Mullan, Zarit, and Whitlatch, 1995; Pearlin, 1982; Pearlin, Mullan, Semple, and Skaff, 1990). As noted by Pearlin and Schooler (1978), “(s)ocial resources are represented in the interpersonal networks of which people are a part and which are a potential source of crucial supports: family, friends, fellow workers, neighbors, and voluntary associations” (p.5). Pearlin (1981, 1986, 1999 and 2012) restricted his focus on social resources to the implications of social support. However, social resources can also include such domains as marital status, other social network ties, and social participation (Jang, Haley, Small and Mortimer, 2002; Mendes de Leon et al., 2001).

When social resources (or lack thereof) intervene in the relationship between stressors related to racial minority status and cognitive functioning, they work as mediators. They can also work as moderators when they reduce the effects of SES or other stressors related to racial minority status on cognitive functioning. For example, social resources have been found by some

researchers to create psychosocial reserve capacity<sup>5</sup> that can also moderate the effects of stressors on negative health outcomes over the life course (Gallo and Matthews, 2003). Also, they appear to give people the sense of belonging in a network and increase self-esteem (i.e., Cobb, 1976), thereby having the power to protect against the negative implications of stress (Cohen and Hobberman, 1983).

Access to social resources has been linked to a reduced risk of cognitive impairment and decline, with individuals who are unmarried/unpartnered, who have smaller social networks, less access to social support and less participation in social activities being more likely to show evidence of cognitive impairment and decline and/or to develop dementia than others (Barnes et al., 2004; Crooks et al., 2008; Fratiglioni et al., 2000; Zunzunegui, Alvarado, Del Ser and Otero, 2003). For example, Håkansson et al. (2009) report findings indicating that individuals who were married or cohabiting with a partner in mid-life were less likely than those who were single, separated, or widowed to show cognitive impairment later in life. Those who were widowed or divorced in mid-life and remained so at follow-up had three times the risk compared with married or cohabiting people. In a longitudinal study of adults aged 65 and older in the U.S., Liu et al. (2019) found that divorced and widowed elders had higher odds of CIND as well as higher odds of impairment in each of the cognitive domains studied) and dementia compared to their married/cohabiting counterparts. Never-married elders also had higher odds of impairment in memory and orientation than their married counterparts but did not differ in the odds of impaired executive function, dementia, or CIND. Similarly, in a study of middle-aged and older adults,

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<sup>5</sup>People are assumed to have a resource bank to cope with the stressful events which has been labeled by Gallo and Matthews (2003) as Reserve Capacity.

Sundström et al. (2016) found that non-married or divorced participants were at higher risk of dementia than married ones.

The social network has been one of the most frequently studied social resources in relation to cognitive performance (Holtzman et al., 2004; Seeman et al., 2001). Although some studies (e.g., Pugh et al., 2020) report little or no relationship between network size and various indicators of cognitive decline in later life, others report a significant relationship. For example, a longitudinal study conducted by Seeman et al. (2011) reported that a higher number of social contacts was significantly associated with better executive function and episodic memory. In another longitudinal study, Holtzman et al. (2004) reported that individuals who had larger social networks at baseline preserved better cognitive functioning scores (MMSE - Mini Mental State Examination) at a later wave and were less likely to experience a decline in cognitive function compared to those with smaller social networks. In another longitudinal study by Crooks et al. (2009), during a 4-year follow-up period, a lower risk of dementia was observed in a sample of older women without dementia at baseline who had larger social networks.

Contradictory findings are also evident in research focusing on social support and cognitive functioning. Some studies report finding no evidence to suggest that emotional, instrumental, or informational support were related to cognitive performance (Hughes et al., 2008). However, a positive association between social support and cognitive functioning has also been noted (Ellwardt et al., 2013; Seeman et al., 2001). For example, Seeman et al. (2011) found social support to be independently and positively associated with episodic memory. Ellwardt et al. (2013) reported finding that emotional support was related to better cognitive functioning and served as a more robust defense against cognitive decline than instrumental support among older adults. Unlike emotional support, instrumental support did not act as a buffer against cognitive

decline. Instead, the researchers reported evidence linking it to more rapid decline. Finally, participation in social activities and interactions with other people have also been found to be linked to higher levels of cognitive functioning and a reduced risk of dementia among older adults (Wang, Karp, Winblad, and Fratiglioni, 2002). Findings reported by Zunzunegui, Alvarado, Del Ser and Oteo (2003) indicate that social disengagement and poor social ties are risk factors for cognitive decline among community-dwelling older adults. In a longitudinal study, James et al. (2011) found that, in a cohort of older adults who did not have dementia at the beginning of the study, increased engagement in social activities was linked to a decrease in the rate of cognitive decline over an average follow-up period of five years. More recently, Fancourt et al. (2020) focused on associations between different types of community engagement and dementia incidence over a 12-year period in a sample of adults aged 50 and older from the English Longitudinal Study of Ageing (ELSA). They found community cultural engagement (e.g., visiting museums, galleries, the theatre) was associated with a lower likelihood of developing dementia in later life while community group engagement (e.g., attending clubs or societies) was only associated with dementia prior to adjustment for social factors. Yet, also drawing on the same dataset, Duffner et al. (2022) reported findings indicating that a greater number of club and other social memberships and more social participation (e.g., going to the cinema) were associated with lower dementia risk.

Empirical findings regarding the role of social resources in mediating relationships between stress-related exposures and health-related outcomes are inconsistent. Researchers have investigated social resources such as marital status, social network ties and social support as potential mediators and moderators of the effect of disability and other stressors on mental health outcomes in samples that include middle-aged and older adults (Bierman, 2012; Brown and

Turner, 2010; Caputo and Simon, 2013; Giao et al., 2020; Ioannou et al., 2019; Russell, Turner, and Joiner, 2009). Several studies (e.g., Avendano et al., 2006; Chou and Chi, 2001; Catabay, Stockman, Campbell and Tsuyuki, 2019; Matthews, Gallo, and Taylor, 2010; Talwar et al., 2017) have found that social resources do function as mediators between exposure to SES inequalities and other stressors and the likelihood of experiencing negative mental health (e.g., depression) and other health-related outcomes (e.g., stroke, mortality). However, some studies have been unable to find evidence of any mediating effect of social resources like social support and social participation on the relationships between stressors like lower SES and such health-related outcomes as stroke (Kuper, Adami, Theorell and Weiderpass, 2007), hypertension (Gorman and Sivaganesan, 2007) and metabolic syndrome (Prescott et al., 2007).

On the other hand, marital status has been found to mediate relationships between stress exposure and mental health and other health outcomes. A significant number of studies have found that individuals who are single or have experienced the loss of a spouse tend to encounter more adverse health outcomes when compared to those who are married or in a spousal relationship (Burman and Margolin, 1992; Charyton et al., 2009; Huler, 2022; Waite and Gallagher, 2000; Wilson and Oswald, 2005; Zimmermann and Easterlin, 2006). It has been noted that widowhood and divorce resulting in grief, economic hardships and loss of social resources can elevate stress that can lead to negative health outcomes including dementia (McFarland et al., 2013). The loss of a spouse can lead to reduced social engagement and weakened social ties with others, including in-laws and friends (Hakansson et al., 2009; Helmer, 2009), which, in turn, increases the risk of cognitive impairment. For example, Zhang et al. (2016) examined the interaction effect of race and gender on the relationship between marital loss and dementia. Their findings revealed that divorced non-Hispanic white men faced a higher risk of dementia

compared to divorced white women, while the differences were not statistically significant for black non-Hispanic older adults.

Further, Vonneilich et al. (2012) found that social network size and frequency of contacts partially mediated relationships between socioeconomic inequalities and subjective health, explaining 15% to 30% of the association in a sample of middle-aged and older adults. As well, research by Von Dem Knesebeck (2005) assessed the role of social networks (including frequency of contact with family members and friends, availability of emotional support) on the relationship between SES and physical and mental health among German adults aged 60 and older. The findings revealed significant, although weak, mediating effects of all three social network indicators. Also, a 7-year follow up study by Zhou et al. (2021) on a sample of adults aged 45 and older revealed that social support mediated the relationship between socioeconomic status and depressive symptoms, explaining approximately 10% of the total effect.

Finally, with regard to social participation, in a cross-sectional study focusing on middle-aged and older adults, Achdut and Sarid (2020) found that the relationship between SES and mental health was mediated by engagement in different social activities. Further, in a longitudinal study of older adults in Taiwan, Gleib et al. (2005) showed that participating in social activities outside the family improved cognitive function in older adults, with those engaged in three or more activities showing the most significant benefit.

With regard to the moderating effects of social resources, researchers have long reported support for the view that social resources and particularly, social support, can buffer the otherwise negative impact of various stress-related exposures on physical and mental health outcomes (e.g., Cohen and Wills, 1985; Eisman et al., 2015; House, 1981; Ichiro and Berkman, 2001; Khan and Hussain, 2010; Lyon and Zucker, 1974). Consistent with this view, the presence

of a marital relationship has been found to moderate the relationship between exposure to various stressors and health outcomes in multiple studies. For example, Cundiff et al. (2016) found that lower income adults who were in supportive marital relationships experienced a decrease in diastolic blood pressure during daily life, suggesting that being married moderated the typically negative impact of low socioeconomic status on health. Similarly, in a cross-sectional study of adults in the US, Ryu and Fan (2023) reported that marital status moderated the relationship between concerns about finances and mental health, such that marriage buffered the stress associated with financial worries.

Researchers have also reported evidence of the moderating effect of other social network indicators including the size and frequency of contacts, on the relationship between SES (unemployment) and self-rated health among adults (Gorman and Sivaganesan, 2007). With a focus on middle-aged and older adults specifically, Olofsson et al. (2018) report evidence of the moderating effects of network size and satisfaction on the relationship between SES (education) and subjective health. The correlation between SES and health was found to be stronger when network satisfaction was high but weaker when it was low.

Evidence for the moderating effect of social support is somewhat contradictory. Based on their systematic review, Tajvar et al. (2016) concluded that evidence for a stress-buffering role of social support on mental health in studies specifically carried out with older adults was somewhat weak, although stronger for associations involving emotional than instrumental support. Recent studies report that the effects of social support on mental health (e.g., depression) are not consistent across SES groups, with higher levels of social support associated with lower depression primarily in lower SES groups. This suggests that social support might be particularly significant for mental health among the most socioeconomically disadvantaged

groups (Ng et al., 2014; Sánchez-Moreno and Gallardo-Peralta, 2022). Su et al. (2022) showed that social support can moderate the relationship between childhood trauma and depression in adulthood. Further, Bostean, Andrade and Viruell-Fuentes (2019) found that family and friend support moderated the negative effect of neighborhood stressors on mental health. In addition, Lee et al., (2023) found in their study that social support moderated the relationship between childhood induced stress and depression in later life in older adults. Further, a study by Mossakowski and Zhang (2014) that used the SPM to address the role of social support on the relationship between exposure to discrimination as a stressor among Asian-Americans and psychological distress suggests that perceived emotional support from family can buffer the effect of stressors resulting from racial minority status.

Finally, in relation to social participation, disparities in self-rated physical and mental health across SES have also been found to be moderated by social participation (Niedzwiedz et al., 2016). Further, Krause's (2006) study of older adults found that the relationship between financial strain and self-rated health was buffered among those who received more emotional support from the people at church. Interestingly, however, support provided by relationships formed outside the church did not have the same effect. Conversely, a similar study (Acevedo, Ellison and Xu, 2014) conducted using a random sample of respondents aged 18 and over revealed that participation in volunteer activities as well as in organisational or religious activities moderated the deleterious effects of economic hardship on psychological distress. Furthermore, Pressman et al. (2009) found that in a diverse sample of young, middle-aged, and older adults, engagement in social activities reduced the negative effect of stress on mental health. Focusing on older adults, one study (Pachana et al., 2016) found that the impact of

stressful experiences like driving cessation in later life on depression can be moderated by participation in different social activities.

With regard to cognitive health outcomes, Perry et al. (2020) showed that marriage/cohabitation moderated the relationship between perceived stress (associated with current financial circumstances and other factors) and cognitive functioning (assessed using a global cognition scale) among older adults. They found no relationships between stress and cognitive functioning among those who were married or cohabitating, but a strong association among those who were not married or cohabiting (i.e., widowed, divorced, or never married). Further, a study by Poye, Burr, and Roberts (2017) on participants aged 70 or older found that being unmarried and living alone was linked to a higher risk of non-Alzheimer's dementia compared to those who are married. Zuelsdorff et al. (2013) examined if social support served to moderate the relationship between stressful experiences (including financial hardship) and cognitive functioning across multiple domains, in middle-aged and older adults who had a family history of Alzheimer's disease. However, they were unable to find any moderating effect of social support on this relationship even though they found a positive relationship between stressful events and lower cognitive functioning as well as between a lack of social support and lower cognitive functioning. Conversely, in their study of older adults in China, Shi et al. (2023) found that social support (emotional support and financial support) played a moderating role in the relationship between socioeconomic status and cognitive ability.

In sum, a review of the literature suggests that social resources may play a key role in mediating and/or moderating relationships between SES and other stressors and health outcomes, including cognitive functioning. To date, however, relevant studies are few in number.

## **Racial Differences in Social Resources**

Research addressing racial disparities in social resources reports contradictory findings. On the one hand, studies suggest that access to social resources varies by race such that racial minorities often tend to be relatively disadvantaged (e.g., Keith and Brown 2018; Maton et al., 1996; Pattillo-McCoy, 1998; Turner, 2013). With regard to marital status, it has been noted that, in the US, blacks are less likely to get married or cohabit compared to whites, with the racial gap in marriage increasing over time (Bloome and Ang, 2020; Cornwell et al., 2008; Zhang et al., 2021). This holds true for older adults regarding marriage (Carr and Utz, 2020), but a study by Brown et al. (2012) found that cohabitation rates among older black adults are similar to those of older White adults. Blacks have also been observed to experience higher divorce rates at every stage of the life course compared to other racial groups including whites and Hispanics (Carr and Utz, 2020). Hispanics have been found to exhibit marriage rates similar to those of whites (Raley et al., 2015). A study of Asian-Americans (Le, 2010) found that their marriage rates closely resemble those of non-Hispanic whites when compared to other racial groups. As well, Asian-Americans show the lowest divorce rates among all racial groups.

Earlier studies often reported that older African Americans tend to have larger social networks and greater social support than whites due to their more extended family structures (e.g., Gibson and Jackson, 1987). However, Ajrouch, Antonucci and Janevic (2001) used a life course perspective to study the effects of race on social networks in a sample composed of people of all ages. These researchers found that blacks tended to have smaller networks, although they also had more contact with network members and more family members in their networks, than whites. Their study also showed that blacks were more likely to experience limited access to social resources provided by groups outside their own racial group. Other, more recent studies,

also report findings indicating that blacks tend to have smaller social networks than whites (Ali et al., 2022; Alwin et al., 2018). It has been noted that since education and employment tend to increase access to social ties and larger social networks, blacks often have limited opportunities to access these social resources over the ‘racialized’ life course. Therefore, blacks are likely to have smaller social networks, fewer social ties, and less contact with network members (Alwin, Thoams and Sherman-Wilkins, 2018).

In addition, with age, blacks have been found to be more likely to lose social ties compared to their white counterparts, thereby limiting their access to social resources (Cornwell, 2015). However, Peek et al. (2001) found no difference in support network size when comparing older (age 65+) African Americans and whites in the US. Similarly, Sharifian et al. (2019) observed no significant difference in network size among older adults from three ethnic/racial groups - Hispanics, African Americans, and whites, contradicting previous findings by Ajrouch et al. (2001) and others who found that racial minorities tend to have smaller social networks. Older Asians, including Chinese and Koreans living in the US, have also been found to have smaller social networks compared to whites and other racial groups (Lubben and Becerra 1987; Wong et al. 2005). Moriarty and Butt (2004) observed that South Asians not only tend to have smaller but more homogenous networks compared to black Caribbeans and whites in the UK. Further, Dong and Chang (2017) found that older Chinese Americans often possess smaller kinship-based networks, potentially leading to greater social isolation compared to the broader American population. This trend parallels the findings of Park et al. (2015), who similarly observed smaller kinship-based networks among older Korean Americans. This has been attributed to the impact of racial segregation which prevents neighborhood voluntary organizations from enhancing interracial ties.

Blacks are also reported to be more likely to interact frequently with friends and to receive more help and support from them compared to whites (Cornwell, Laumann and Schumm, 2008; Grief, 2009; Mitchell et al., 2020). All of these studies concluded that blacks have social ties that serve as frequent sources of support (Nguyen et al., 2017). African Americans and black Caribbeans have also been reported to have larger social support networks of fictive kin compared to whites, although whites have been reported to receive more support from their fictive kin due to their stronger ties with them (Taylor, Chatters, Woodward and Brown, 2013). In a study focusing on Hispanics, Comeau (2012) found that frequency of contact with social network ties was higher among Hispanics compared to whites but the same as blacks. However, this study included only nuclear and extended family members and did not include friends as part of social network ties. Asian Americans have also been observed to maintain frequent contact with their family members and friends (Fu and Vong, 2016). However, there is a lack of studies investigating their frequency of contact with social network ties in comparison to other racial groups. In a study focusing specifically on older adults, Peek et al. (2001) found older African Americans had significantly less frequent interaction with others than did older whites. However, they also report that older African Americans actually had significantly higher frequency of interaction with their children, did not differ in their frequency of interaction with other family members, and had a significantly lower frequency of interaction with friends compared to older whites. Thus, they note that racial difference in the overall frequency of interaction was likely being driven by the component of interaction with friends.

Racial differences in social participation have also been observed in few studies. It has been noted that racism, lower SES and cultural differences tend to restrict the access of racial minority group members in general to social groups that engage in various social activities

(Barnes, Mendes de Leon, Bienias and Evans, 2004). These social factors also tend to discourage their engagement in volunteer activities as well as access to many social organizations and festivals (Miner and Tolnay, 1998). With regard to participation in organizations, older blacks appear less likely to participate in social activities compared to their white counterparts (Fischer and Schaffer's, 1993; Tang, Copeland and Wexler, 2012). This inequality in access has been attributed to racial disparities in access to volunteer roles, marginalisation, racial segregation and lower SES due to the cumulative disadvantages over the life course (Dannefer, 2003; Sarkisian and Gerstel, 2004; Tang, Copeland and Wexler, 2012). However, whereas Asian-Americans appear to participate in group activities with family and friends, blacks tend to participate more in church-related group activities (Alwin, Thoams and Sherman-Wilkins, 2018). Church support networks are noted to be more important sources of social support among older African Americans compared to their white counterparts (Assari and Lankarani, 2018; Krause et al., 2002; Mitchell et al., 2020).

Some researchers have argued that the inconsistency in the findings on racial differences in social resources reflects differences in SES rather than racial position. For example, Tobin et al. (2021) argued that black-white disparities in social support disappear when SES differences are taken into account. Others point to differences in the importance of social support in moderating relationships between stress-related exposures and health-related outcomes depending on race. For example, in the Canadian context, Kim and Noh (2016) found a stress buffering role of ethnic social support<sup>6</sup> on depressive symptoms among Ethiopians, Iranians and Koreans but not among Irish and Vietnamese individuals aged 18 or older. However, Noh and Avison (1996) did not find a moderating role of ethnic social support on the relationship between

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<sup>6</sup> The social support that derives from one's own ethnic social network.

stress exposure (i.e., negative life events and the chronic strains associated with immigration) and psychological well-being among Korean immigrants aged 18 years or over. In addition, Mossakowski and Zhang (2014) found that social support can buffer the impact of stress related to discrimination and thereby protect the psychological well-being of Asian Americans. Further, Gaffey et al. (2019) report findings indicating that whereas inner-city black women appeared to be more susceptible to trauma-related distress (such as PTSD) than white women and also, reported lower support compared to white Hispanic and non-Hispanic women, the moderating (stress-buffering) effects of social support were significant for black women only.

When it comes to the role of social resources in influencing racial disparities in cognitive functioning, including its role in mediating and/or moderating the effects of SES or other stressors, research evidence is scarce. One longitudinal study by Barnes et al. (2004) found that social resources protect against cognitive decline similarly among older African Americans and whites, except for a stronger association of social engagement with cognitive function change observed in whites. Further, Sharifan et al. (2019) suggested that social network characteristics have the potential to moderate black-white differences in cognitive functioning in later life but they did not formally test the moderating effect.

Overall, a review of empirical research on racial disparities in social resources suggests that older racial minority group members often, though not always, have smaller social networks comprised of family members, and they are also less likely to participate in community activities compared to whites. However, with the exception of blacks, marriage rates among other racial groups appear comparable.

## 2.6 Summary

In summary, this chapter reviewed literature regarding racial disparities in cognitive functioning. Initially, it examined studies identifying racial differences in cognitive functioning during middle and later life. The chapter then explored the utility of an intersectionality approach for an understanding of the joint implications of race and other sources of inequality (including race and gender interactions as well as race and immigrant status interactions) on cognitive health outcomes. It also addressed the application of the SPM for assessing the relationship between social position, primary and secondary stressors, social resources, and cognitive health outcomes. The mediating effects of social stressors and resources along with the moderating effect of social resources on the relationship between race and cognitive functioning were emphasized. Finally, it examined racial differences in social resources in order to understand whether they mediate and/or moderate racial disparities in health outcomes such as cognitive functioning.

This review revealed several important findings. First, a review of studies that have focused on racial disparities in cognitive functioning suggests that at any given point in time, such disparities do appear to exist, with those classified as non-white often reported to fare more poorly than those classified as white. Secondly, it also revealed the potential importance of the intersecting impacts of race and other dimensions of inequality, for an understanding of cognitive health disparities within diverse populations. Moreover, various studies (Yaffe et al., 2013; Zhang, Hayward, and Yu, 2016) have observed that lower socioeconomic status indicators, such as lower education, lower income, and lack of homeownership, contribute to explaining the relationship between racial minority status and cognitive functioning. Finally, there is substantial evidence that social resources like social networks, social support, and social participation can

mediate and/or moderate health outcomes in general (e.g., Antonucci, Ajrouch and Janevic, 2003; Gorman and Sivaganesan, 2007; Mouzon et al., 2013) and cognitive functioning specifically (Perry et al., 2021; Poye, Burr and Roberts, 2022).

At the same time, the chapter also revealed several important knowledge gaps. Most of the studies addressing racial disparities were conducted in the US context, with very few conducted in Canada. As well, most have focused on black or Hispanic versus white racial disparities, thereby obscuring other racial minority groups, including those more prevalent in the Canadian context (e.g., South Asian, Chinese). An absence of a sociological perspective on research in the area was also observed. For example, an intersectionality framework was rarely employed to facilitate an understanding of race/gender or race/immigrant status differences in cognitive functioning. Furthermore, despite its prominence, very few studies employed the Stress Process Model to investigate the mechanisms mediating and/or moderating relationships between race and other social structural locations, exposure to stressors, social resources, and cognitive functioning. Consequently, research addressing these mechanisms is also lacking. Additionally, the narrow emphasis on negative life events as primary stressors, rather than on chronic stressors like lower SES and poor psychological well-being, demonstrates the need for research that takes such stressors into account. To address these gaps, the next chapter introduces the conceptual framework, research objectives and hypotheses addressed in this study.

# **CHAPTER THREE**

## **CONCEPTUAL FRAMEWORK AND RESEARCH**

### **OBJECTIVES**

This chapter presents the conceptual framework being used in this study along with the research questions and hypotheses being addressed.

#### **3.1 Conceptual Framework**

The objective of this research is to examine racial disparities in cognitive functioning and the role of various stressors (socioeconomic, psychosocial) and social resources on relationships between race and cognitive functioning. To the best of my knowledge, no study has examined how other social positions, such as gender and immigrant status, intersect with race, to impact cognitive functioning among older adults in the Canadian context. Also, previous research has shown that racial minority status is associated with lower cognitive functioning, but the mechanisms underlying this relationship are still unclear. Some studies suggest that racial minorities are more susceptible to exposure to socioeconomic stressors and this, in turn, has a negative impact on cognitive functioning. Additionally, some studies suggest that sufficient access to social resources can moderate the effects of stressors and decrease an individual's vulnerability. However, there is no single model that comprehensively incorporates all of these elements to explain the stress process as it is experienced by racial minority members and which may contribute to poorer cognitive functioning in middle and later life.

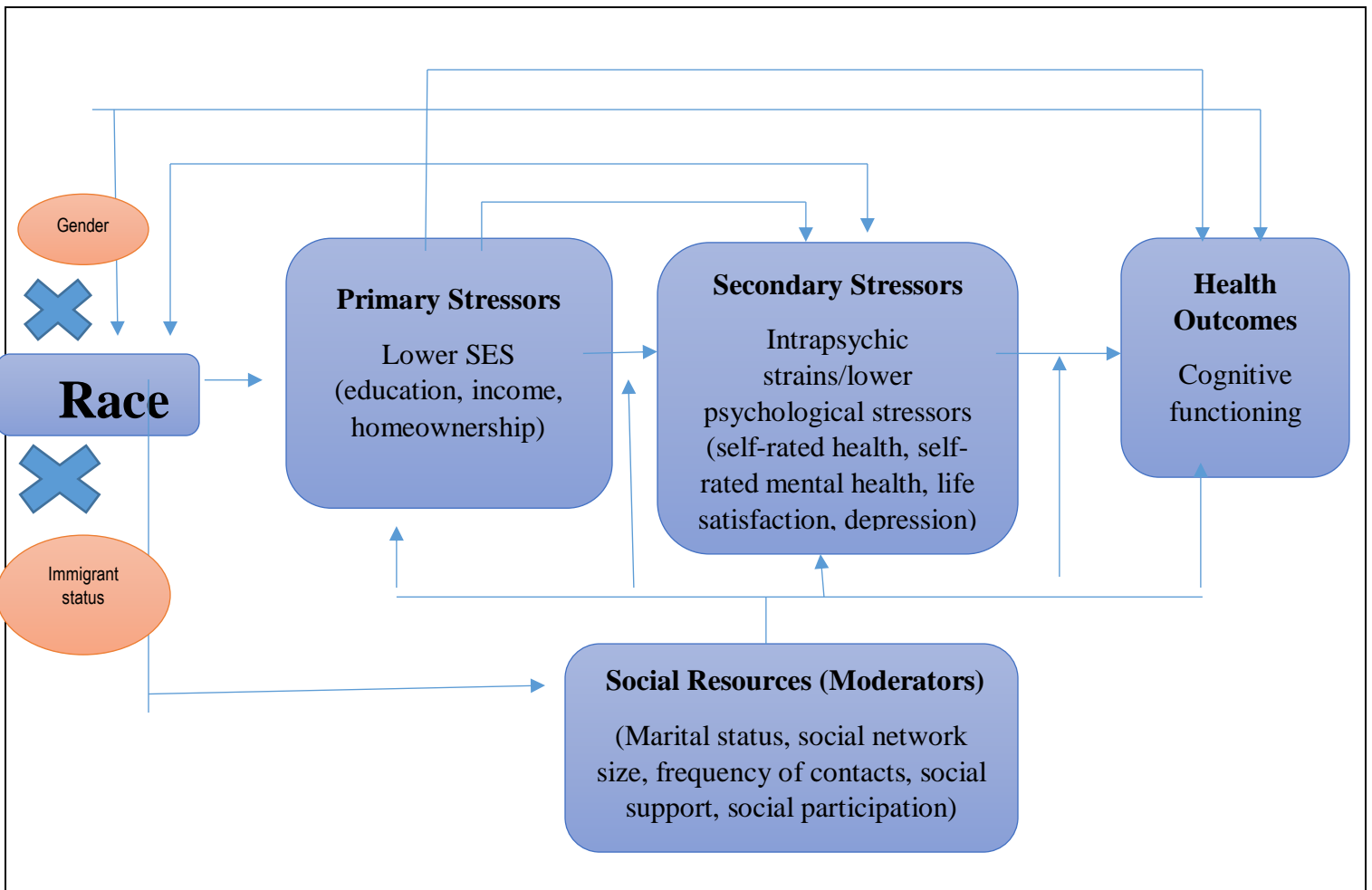
To examine the process, including the mechanisms linking racial minority status and cognitive functioning, this study draws on an Intersectionality Framework and the Stress Process Model (Pearlin, 1990) to guide the analyses. The model to be utilized, as outlined in Figure 3.1, focuses on how social factors impact individual health through stress exposure, mediation, and moderation. It emphasizes the role of ascribed statuses as social structural factors that influence cognitive health. The model also suggests that individuals who belong to racial minority groups experience greater stress exposure, which, in turn, affects cognitive functioning. It also emphasizes how the interplay of social structural factors and psychosocial processes contribute to the relationship between stressors and health-related outcomes. Furthermore, possessing adequate social resources can also moderate the potentially adverse effects of stress exposure on cognitive health.

To investigate the major relationships specified in the SPM, stressors, including primary stressors (i.e., indicators of lower socioeconomic status such as lower education, lower income, and non-homeownership) as well as secondary stressors (e.g., poor self-rated physical and mental health, depression and lower life satisfaction) that follow from primary stressors and reflect intrapsychic or psychological strains, are examined. The model also acknowledges that social resources, such as marital status and other social network ties, social support, and social participation, can act as both mediators and moderators of the relationship between stress exposure and cognitive functioning. However, in line with previous research, the focus of this study is on their moderating effects. According to Pearlin and Bierman (2013, p. 330), it is imperative that we investigate the moderating effects of psychosocial resources given the gaps that exist in our current understanding and the need to discern precisely which resources can effectively reduce effects of particular stressors across diverse population. The need to develop

policies that reduce the negative effects of active stressors on cognitive health underscores the importance of focusing on the moderating effects of social resources in the present study.

Overall, by drawing on the SPM, this study aims to increase our understanding of the complex process and mechanisms that link racial minority status and cognitive functioning, including the role of various stressors and social resources on this relationship.

**Figure 3.1. The Stress Process Model as Applied to Racial Disparities in Cognitive Functioning**



Source: Adapted from Pearlin (1990, 2012).

### 3.2 Research Questions

Based on the knowledge gaps and theoretical frameworks identified in the previous discussion, the following research questions have been generated:

1. Are there racial disparities in cognitive functioning in middle and later life?
2. Do racial disparities intersect with other social structural locations (e.g., gender, immigrant status) to influence cognitive functioning in middle and later life?
3. Do differences in exposure to stressors (primary and secondary) mediate the relationship between racial minority status and cognitive functioning in middle and later life?
4. Do social resources moderate the effect of stressors on cognitive functioning in middle and later life differently across racial groups?

In relation to the first research question, based on prior research evidence, it is anticipated that individuals from racial minority backgrounds are likely to exhibit poorer cognitive functioning in middle and later life than individuals from non-minority backgrounds. Thus, the following hypothesis will be tested:

**Hypothesis 1:** People belonging to racial minority groups are likely to demonstrate poorer cognitive functioning during middle and later life compared to their non-minority counterparts.

The second research question takes into account the fact that racial minority status intersects with other indicators of social structural location. An intersectionality approach directs attention to how racial minority status intersects with gender, immigrant status, and other social locations to collectively influence the cognitive health of middle-aged and older adults. Hence, cognitive functioning differences may be observed among various race-gender groups, including

racial minority females, racial minority males, white females, and white males, as well as among different race-immigrant status groups, such as racial minority immigrants, racial minority non-immigrants, white immigrants, and white non-immigrants. Based on previous literature (e.g., Avila et al., 2019), it is expected that racial minority men will perform worse on cognitive tests in the memory domain compared to white women, white men, and racial minority women. As there is limited literature on the executive functioning domain, no hypotheses could be formulated for this area in particular. Regarding the interaction of race and immigrant status, it is expected that racial minority immigrants will perform worse than white immigrants, white non-immigrants, and racial minority non-immigrants, based on studies (e.g., Brown, 2018) indicating that the 'Healthy Immigrant Effect' does not appear to extend to racial minorities. Thus, the following hypothesis will be tested:

**Hypothesis 2:** Racial minority status will intersect with other social structural locations (e.g., gender, immigrant status) to influence cognitive functioning in middle and later life.

Based on the Stress Process Model, it is expected that stress process factors, including primary and secondary stressors, will serve as mediators in the relationship between racial minority status and cognitive functioning, as assessed in the third research question. Racial minority group members are anticipated to encounter higher levels of exposure to stressors, such as lower socioeconomic status and greater intrapsychic or psychological strains (reflected in reduced feelings of well-being), compared to whites, potentially contributing to lower cognitive functioning in middle and later life. Accordingly, the third hypothesis states:

**Hypothesis 3:** Associations between racial minority status and cognitive functioning will be mediated by differences in exposure to stressors (primary and secondary).

Finally, in line with previous research, social resources such as marital status and other social network ties, social support, and social participation are expected to moderate the relationship between racial minority status and cognitive functioning. That is, it is anticipated that when exposed to stressors, even when they have similar levels of access to social resources, racial minorities are less likely to derived benefit from them. Hence, the following hypothesis will be tested:

**Hypothesis 4:** Associations between stressors (primary and secondary) and cognitive functioning will be moderated by differences in the level of social resources available across racial groups.

### **3.3 Summary**

This chapter has outlined the objectives of this study: to examine racial disparities in cognitive functioning and the role of various stressors (socioeconomic, psychosocial) and social resources on relationships between race and cognitive functioning. In previous research, researchers often failed to draw on sociologically-informed theoretical frameworks when explaining the mechanisms that lead to lower cognitive functioning in middle and later life. However, this study provides a conceptual framework that integrates the intersectionality framework with the SPM and focuses on the importance of both socioeconomic and psychological stressors and social resources to address racial disparities in cognitive functioning. Based on the conceptual framework and previous research, a number of research questions and hypotheses were developed. The subsequent chapter details the research design and methods used to address these research questions and hypotheses.

# CHAPTER FOUR

## METHODOLOGY

### 4.1 Study Design and Sample

In order to examine racial disparities in cognitive functioning and the mechanisms underlying this relationship, this study uses baseline data from the Canadian Longitudinal Study on Aging. The CLSA was deemed the most suitable dataset as it encompasses a large nationally generalizable sample of middle-aged and older adults who underwent several cognitive tests. Additionally, it includes variables such as self-rated health and self-reported depressive symptoms, providing a fairly comprehensive insight into the participants' intrapsychic or psychological strain or well-being. Moreover, it incorporates established and well-validated measures, including the CESD-10 tool assessing depressive symptoms and the MOS instrument for measuring social support.

Using stratified random sampling, this nation-wide survey obtained baseline data from 51,338 Canadians aged 45 to 85 years and will continue collecting data, every three years, for 20 years (or until the death of participants). The baseline data were collected from 2012 to 2015 and the first follow-up took place from 2015 to 2018. The sample was divided into two cohorts: (1) the CLSA Tracking cohort, which aimed to recruit 20,000 individuals from all 10 provinces in Canada, and (2) the CLSA Comprehensive cohort, which aimed to enroll 30,000 individuals

residing within 25-50 km of one of the 11 Data Collection Sites (DCS) located in seven provinces in Canada.

The CLSA Tracking cohort used the Canadian Community Health Survey (CCHS) on Healthy Aging as the initial source of participants and applied the same selection criteria used in the CCHS Healthy Aging (CCHS-HA) Cycle 4.2 survey for recruiting all participants (Raina et al., 2009). The CLSA team employed three additional sampling sources to randomly select samples for both the CLSA Tracking and Comprehensive cohorts. These sources were Provincial Health Registries (HR), Random Digit Dialing (RDD) for telephone sampling, and the Quebec Longitudinal Study on Nutrition and Aging (NuAge). The inclusion criteria applied to select participants from these three sampling frames were identical to those used in CCHS-HA.

The survey excluded people living in an institution (at baseline), people living on First Nation's reserves, those who were unable to communicate in English or French, members of the Canadian Armed Forces and those suffering from severe cognitive impairment. In order to screen for cognitive impairment, various in-person as well as telephone screening tools were used. The CLSA team recognized a total of 12 telephone screening tools to identify individuals who lacked the capacity to give informed consent due to significant impairment. Those who were identified as unable to understand why the survey was being conducted, who could not give consent, or could not provide data were considered cognitively impaired and were excluded (Raina et al., 2009).

The Tracking cohort, which includes 21,241 participants, was interviewed over the telephone. This was done through computer-assisted telephone interviews (CATI). All telephone interviews were conducted at one of four universities: the University of Victoria, University of Manitoba, Université de Sherbrooke, and Dalhousie University. The baseline Comprehensive

cohort includes 30,097 people whose data were collected through in-home interviews. These participants were asked go to a local data collection site (DCS) for additional (non-survey) data collection (physical examination and neurophysiological specimen). The 11 cities that these data collection sites were located in included: Victoria, Vancouver, Surrey, Calgary, Winnipeg, Hamilton, Ottawa, Montréal, Sherbrooke, Halifax, and St. John's.

## **4.2 Measurement**

The CLSA includes data on variables of central importance to this study: racial identification, stressors (i.e., socioeconomic status, psychological strains), social resources (i.e., marital status, social network, social support, social participation), and cognitive functioning along with various socioeconomic, demographic and other variables that are central to the analyses.

### **Dependent Variables**

The dependent variable reflects the respondent's level of cognitive functioning. Cognitive functioning incorporates multiple cognitive abilities such as memory, learning, reasoning, problem solving, and decision-making. In the CLSA dataset, it was operationally defined in terms of performance on tests in three domains - memory, executive functioning and psychomotor speed. These domains were originally selected for inclusion in the CLSA because "each has been shown to correlate with everyday functioning (i.e. physical, behavioral, and social) in cross-sectional and longitudinal studies" (Tuokko et al., 2016, p. 3).

Memory refers to the storage where the knowledge that people learn and use to behave in different surroundings is kept. This process of storing information includes two stages: short-term memory (lasting for seconds to hours) and long-term memory (lasting for days to years)

(Sherwood, 2013). When learning about respondents' cognitive ability, cognitive test performance based on short-term memory is usually used. Executive functioning can be referred to as the set of cognitive abilities needed to guide our behaviour in a certain way to achieve a certain goal, especially in novel or non-routine situations (Banich, 2009). As such, it includes a number of diverse abilities: "prioritizing and sequencing behavior, inhibiting familiar or stereotyped behaviors, creating and maintaining an idea of what task or information is most relevant for current purposes (often referred to as an attentional or mental set), providing resistance to information that is distracting or task irrelevant, switching between task goals, utilizing relevant information in support of decision making, categorizing or otherwise abstracting common elements across items, and handling novel information or situations" (Banich, 2009, p. 89). Given this diversity, different tasks are generally used to assess these different components, often within a time limit. Such tasks might involve organizing cards by color within a set time limit, or arranging balls from start to finish in the minimum number of moves. If cards are misclassified or the task isn't completed on time, or if more moves are required to position the balls, these are indicators of executive dysfunction. Finally, psychomotor speed is typically assessed using reaction times (e.g., pressing certain keyboard button when there is a visual signal) (Houx and Jolles, 1993; Jorgensen et al., 2015).

In the CLSA, the Tracking cohort participants' performances were assessed in two domains - memory and executive functioning - while Comprehensive cohort participants were asked to complete tests in all three domains - memory, executive functioning and psychomotor speed. Therefore, the combined dataset that is being used for this study draws on cognitive tests in the two domains that respondents in both cohorts participated in – that is, memory and

executive functioning. The scores on four tests in these two domains are used to measure cognitive functioning.

### ***Memory***

To assess memory functioning, the Rey Auditory Verbal Learning Test (RAVLT) - consisting of Rey-I and Rey-II trials - is used (Rey, 1964). Participants were asked to read a list of 15 items (i.e., 15 nouns including the words: drum, curtain, bell, coffee, school, parent, moon, garden, hat, farmer, nose, turkey, color, house and river) and then recall them. In the CLSA, only Trial 1 of the five RAVLT learning trials included in the original form was administered, with a delayed recall trial administered approximately five minutes later. Trial 1 was used as a measure of immediate memory recall (Rey-I), with Trial 2 (Rey-II) used to assess retention (Tuokko et al., 2017; 2020). Each item that was recalled received a score of 1 for each trial, resulting in scores ranging from a low of 0 to a high of 15 on each.

Previous studies (Mitrushina, Satz, and Van Gorp, 1989; Petersen et al., 1997) have reported that people with mild cognitive impairment and Alzheimer's disease are able to remember fewer words compared to control groups. Several studies (Butler, Retzlaff, and Vanderploeg, 1991; Estévez-González et al., 2003; Tierney, 2001) have noted that the RAVLT is a great tool due to its sensitivity and specificity that enable it to detect early declines in cognitive functioning (Backman, et al., 2005), to identify differences between Parkinson's dementia, dementia of an Alzheimer's type, and normal aging, as well as to evaluate older patients who experience memory problems due to head trauma versus those with amnesia (Mungas, 1983). Among the different neuropsychological test tools, the RAVLT also reportedly has good test-retest reliability ( $.51 \leq r \leq .86$ ) (Lezak et al., 2004). In their longitudinal study, Tierney, Yao, Kiss and McDowell (2005) found evidence that the RAVLT could reliably predict the likelihood

of developing Alzheimer's disease (AD) after 5 or 10 years in a sample of individuals without dementia.

Overall, given its reliability and validity, the RAVLT is a widely used tool among psychologists (Tuokko, Griffith, Simard and Taler, 2017). Further, a number of studies (e.g., Schwartz et al., 2004; Yano et al., 2017) have used the RAVLT to understand racial disparities in cognitive functioning. Overall, therefore, in order to identify the cognitive performance of the study participants at baseline as well as the differences across races, the RAVLT appeared to be the best tool available to assess the cognitive functions such as attention, concentration, verbal learning and memory (Correia and Osorio, 2014).

### ***Executive Functioning***

An examination of executive functioning is based on two tests: the Mental Alternation Test (MAT) and the Animal Fluency Test (AFT).

The MAT (Teng, 1994) enables researchers to examine the processing speed, working memory and mental flexibility of an individual. It has two parts: Part A focuses on performance on two tasks: 1) counting from 1 to 20; and 2) reciting the letters of the alphabet as fast as possible. Part B is a cognitive switching task that asks participants to alternate between the numbers 1-26 and the letters of the alphabet (i.e., 1-A, 2-B, 3-C, etc.) in 30 seconds. Scores are based on Part B and range from 0-52, with higher scores indicating better executive functioning. If respondents fail to complete Part A, Part B is not conducted and were coded as missing.

This screening test has been identified by several researchers (Jones et al., 1993; Salib and McCarthy, 2002) as a reliable tool to detect cognitive impairment or lower cognitive functioning. For example, Jones et al. (1993) report good test–retest reliability ( $r = .80$ ) when administered in person twice in one day. In order to examine the validity of this test, Billick,

Siedenburg, Burgert, and Bruni-Solhkhah, (2001) compared test scores to those obtained using the Mini-Mental State Examination (MMSE) test. They report that “The MAT score was found to correlate significantly with the MMSE score ( $r = .84, P < .0001$ ). Scores on the MAT were predictive of scores on the MMSE, with a sensitivity of 91% and a specificity of 100%.” (p.202).

The Animal Fluency Test (AFT – Read, 1987) requires participants to name as many animals as they can in 60 seconds. Test scores are based on their performance (i.e., the number of animals they can recall). The scoring algorithm that was used was strict which means participants receive points only when they mention animals that are different species (O’Connell et al., 2022, Tuokko et al., 2017). Possible test scores range from 0-52 (Tuokko et al., 2017; 2020). Previous studies (e.g., Sebaldt, 2009) have found this test to be very helpful in detecting cognitive impairment at an early stage. Its specificity and sensitivity as a screening tool for the preoperative evaluation of older patients has been observed in a study conducted by Long, Wolpaw and Leung (2015). Tierney, Yao, Kiss and McDowell (2005), in a longitudinal study, found the AFT was a good tool to predict AD among participants after five years. Another study by Long, Wolpaw and Leung (2014) illustrated how the AFT is a useful cognitive test to detect if older patients have pre-existing cognitive impairment before surgeries to prevent postoperative delirium.

Table 4.1 shows the correlations between the four cognitive measures. Rey-I scores show a strong correlation with Rey-II scores. Conversely, both MAT and AFT scores demonstrate weak to moderate correlations with Rey-I and Rey-II scores as well as with each other. Notably, however, all correlations are positive and significant. Those who score higher on one domain and measure of cognitive functioning also score higher on other domains and measures.

**Table 4.1: Pearson’s Correlations among Cognitive Test Scores**

	Rey-I	Rey-II	MAT	AFT
Rey-I	1.0000			
Rey-II	0.754***	1.0000		
MAT	0.265***	0.221***	1.0000	
AFT	0.325***	0.293***	0.380***	1.0000

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$  (two-tailed test).

To assess the validity of the four cognitive tests, we also examined their relationship with established indicators of cognitive functioning, such as diagnosed memory problems. Table 4.2 shows the results of t-tests conducted to compare mean scores on each of the four cognitive measures used in this study among those with and without a diagnosed memory problem (as self-reported). It shows that individuals without a diagnosed memory problem score significantly higher on all four cognitive measures — Rey-I, Rey-II, MAT, and AFT — compared to those with a diagnosed memory problem. The statistical significance of these differences is confirmed by the very low p-values ( $<0.001$ ) for all tests. Hence, it can be concluded that the cognitive tests accurately measure cognitive functioning as expected based on the presence of memory problems, thereby validating their use for assessing cognitive functioning.

**Table 4.2: T Test Results Comparing Cognitive Test Scores between Individuals with and without Memory Problems**

Cognitive Test	Mean Difference	t-test	P Value
Rey-I	1.103	30.229	0.001
Rey-II	1.295	31.612	0.001
MAT	3.841	23.974	0.001
AFT	2.412	24.364	0.001

## **Social Position**

The main independent variable of interest is racial minority status. Here, race is viewed as socially constructed due to its historical roots in colonialism and slavery and its use by dominant racial groups to make racial minorities feel inferior (Satzewich and Liodakis, 2013). To assess this variable, respondents were asked: “People living in Canada come from many different cultural and racial backgrounds. Are you... (White, Black, Chinese, South Asian, Filipino, Latin American ...)?” Responses were coded into 14 categories. However, subsample size restrictions limited my ability to focus on all of these racial groups. Therefore, for most of the analyses, two groups were compared: those who self-identified as whites were included in the ‘white’ category and other participants (n=3,237) were included in a ‘racial minority’ category. For subsequent in-depth analysis, twelve racial minority subgroups are also compared: 1) Black only, 2) Korean only, 3) Filipino only, 4) Japanese only, 5) Chinese only, 6) South Asian only, 7) Southeast Asian only, 8) Arab only, 9) West Asian only, 10) Latin American only, 11) Other racial or cultural origin only, and 12) Multiple racial or cultural origins.

In addition to race, a number of studies (e.g., Haan, Al-Hazzouri and Aiello, 2011; Ruitenbergh, Ott, van Swieten, Hofman and Breteler, 2001) have found that other social positions such as gender and immigrant status are also associated with cognitive functioning. Gender was assessed as a binary indicator (man, woman). This study also takes into account immigrant/nativity status (immigrant, non-immigrant) but not the duration of stay as very few immigrants were recent immigrants (e.g., only 5% with a duration of 10 years or less). Interactions between both of these variables (gender and immigrant status) and racial minority status are included in the analyses.

## **Primary Stressors**

The CLSA data allow for the inclusion of primary stressors such as lower SES in the analyses. Based on the availability of data and the association of lower SES with negative health outcomes found in several studies (e.g., Abu-Bader, Rogers, and Barusch, 2008; Franks, Gold and Fiscella, 2003; Gianaros et al., 2007; Laaksonen, Rahkonen, Martikainen and Lahelma, 2005), lower education, lower income and no homeownership have been selected as independent variables indicating exposure to lower SES.

Education is measured based on the highest level of schooling obtained: (1) Less than secondary school graduation, 2) Secondary school graduation, no post-secondary education, 3) Some post-secondary education, and 4) Post-secondary degree/diploma. Income is measured using total household income in the past 12 months: 1) Less than \$20,000, 2) \$20,000 or more, but less than \$50,000, 3) \$50,000 or more, but less than \$100,000, 4) \$100,000 or more, but less than \$150,000, or 5) \$150,000 or more. To measure homeownership, participants were asked whether they owned or rented their dwelling. Responses were coded into two categories: 0) Homeowner and 1) Non-homeowner.

Table 4.3 reports the correlations evident among the three primary stressors. Importantly, all correlations are statistically significant. Education displays a weak to moderate, yet positive correlation with household income and a weak but negative correlation with homeownership. Those with higher levels of education also reported higher incomes and were less likely to be non-homeowners than those with lower levels of education and income. Similarly, household income demonstrates a weak negative correlation with non-homeownership.

**Table 4.3: Pearson’s Correlations among Primary Stressors**

	Education	Household Income	Homeownership (0=Homeowner, 1=Non-homeowner)
Education	1.0000		
Household Income	0.283***	1.0000	
Homeownership (Homeowner=0, Non- Homeowner =1)	-0.116***	-0.349***	1.0000

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$  (two-tailed test).

### **Secondary Stressors**

The stress associated with lower SES can also give rise to other (intrapsychic or psychological) stressors which can be referred to as secondary stressors. Self-rated general and mental health, levels of life satisfaction and depression were included in this study. Each appears to be influenced by SES based on previous studies (e.g., Chen et al., 2002; Jenkins, Belanger, Londoño Connally, Boals, and Kelly, 2013; Taylor et al., 2004). Further, all have been used to measure psychological well-being in several studies (e.g., SRH in Hosseini et al., 2019, both SRH and SRMH in Stubbs et al., 2021, life satisfaction in Mantovani et al., 2016, and depression in Hemert et al., 2002).

Self-rated overall health and mental health were assessed using responses to questions asking respondents, “In general, would you say your health/mental health is excellent, very good, good, fair, or poor?” Scores range from 1 to 5, with higher scores indicating better self-ratings. SRH has been reported to have high levels of reliability and validity as a measure of subjective health status (e.g., Lundberg and Manderbacka, 1994). There is evidence that the SRH measure

is a reliable and valid tool for evaluating overall subjective well-being. For example, a study by Hosseini et al. (2019) demonstrates that the SRH measure is strongly correlated with the WHO-5 Well-being Index. According to DeSalvo et al. (2006), it “demonstrates good alternate forms of reliability and good reproducibility” (p.191). Similarly, a study by Crossley and Kennedy (2002) found that self-rated health showed great stability among a sample of Australian people. However, a study conducted in the US by Zajacova and Dowd (2011) showed inconsistency among respondents when rating their health again (1 month apart) which they attributed to the sociodemographic characteristics of the respondents (i.e., racial minority status, less education). As well, the sensitivity of SRH measures to cultural differences has been noted. On the one hand, some researchers report satisfactory construct validity and test-retest reliability even in middle and low-income countries (e.g., see Cullati et al., 2018). Conversely, Vuorisalm et al. (2008) compared SRH measurements across two distinct social and cultural environments – Russia and Finland. They found that the differences in SRH in these two countries derived from how differently they evaluate health, suggesting that SRH also appears to be at least somewhat culturally sensitive.

Several studies have also found SRMH to be a highly reliable tool (Kahar and Nergoni, 2020). According to McDowell's (2006) analysis of previous studies, single-item measures like SRMH exhibit high test-retest reliability, with a range of 0.70 to 0.80 over brief time intervals (Assari, Dejman and Neighbors, 2016). In terms of validity, in their study of Korean American older adults, Jang et al. (2012) discovered a significant correlation between SRMH and other mental health measures, specifically the Center for Epidemiological Studies-Depression (CES-D,  $r=0.42$ ), the Patient Health Questionnaire (PHQ-9,  $r=0.50$ ) and the Geriatric Depression Scale (GDS,  $r=0.42$ ). Mawani and Gilmore (2010) conducted a study that demonstrated a strong

correlation between self-rated mental health and other mental health measures, including the World Health Organization Composite International Diagnostic Interview (WMH-CIDI) and stress level. This suggests that SRMH is closely associated with established mental health assessments, highlighting its potential as a valuable tool in assessing mental well-being.

Overall life satisfaction is measured using the five-item Satisfaction with Life Scale (SWLS - Diener et al., 1985). Respondents were asked how strongly they agreed or disagreed (on a scale ranging from (1) strongly disagree to (7) strongly agree) with the statements: “In most ways my life is close to ideal”, “The conditions of my life are excellent”, “I am satisfied with my life”, “So far I have gotten the important things I want in life”, and “If I could live my life over, I would change almost nothing”. By adding the scores together, total scores ranged from a low of 5 to a high of 35, with higher scores indicating greater life satisfaction. The SWLS is one of the most widely used measures of well-being and has been reported to be a valid scale in numerous languages and countries (e.g., Blais et al., 1989; Jovanović and Lazić, 2020; López-Ortega et al., 2016; Sancho et al., 2014; Vazquez et al., 2013). Pavot and Diener (2009) reported “a coefficient alpha (internal consistency) of 0.87 for the scale and a 2-month test-retest stability coefficient of 0.82” (p.106). Similar levels of consistency and reliability were found in studies by Yardly and Rice (1991), Alfonso and Allison (1992a) and Magnus, Diener, Fujita, and Pavot (1993). In a more recent study by López-Ortega, Torres-Castro and Rosas-Carrasco (2016), the SWLS showed moderately high internal consistency (Cronbach's alpha of 0.74) as well as significant inter-item correlations with moderate to high values (0.64 to 0.74). In my study, SWLS showed high internal consistency and reliability of the items in the scale as the Cronbach's alpha was 0.84.

Finally, depression is assessed using a derived variable based on the Center for Epidemiological Studies Depression Scale, short-form (CESD-10) (Anderson, Malmgren, Carter and Patrick, 1994). In this study, both SRMH and depressive symptoms are included. This is based on the view that mental health and mental illness reflect distinct phenomena, rather than the extreme ends of a single spectrum (Iasiello and van Agteren, 2020; Payton, 2009). For example, some people may initially describe their mental health as good, very good, or excellent, despite receiving a diagnosis of mental illness.

The CESD-10 is a 10-item scale assessing depressive symptoms in the past week. It includes questions asking respondents how often in the past week they had experienced feelings of depression, loneliness, hopefulness for the future, restless sleep and so forth. Response options for each question included: (0) all of the time (5-7 days), (1) occasionally (3-4 days), (2) some of the time (1-2 days), and (3) rarely or never (less than one day). Negatively-worded items were reverse-coded before creating a summary measure ranging from 0 through 30, with higher scores indicating higher levels of depression.

The CESD-10 has been validated for use with older adults, with studies reporting good psychometric properties: high internal consistency, construct and predictive validity, as well as invariance across racial status groups (Anderson et al., 1994; Irwin et al., 1999; Mohebbi et al., 2018). In a sample of middle-aged depressed patients in one study and a sample of older depressed patients in another study, the CESD-10 was found to be a very reliable (high test-retest reliability) screening tool with high sensitivity, specificity and positive predictive value (Irwin, Artin and Oxman, 1999). Also, the CESD-10 scale displayed high reliability, with a Cronbach's alpha of 0.89, and strong validity as evidenced by a significant negative correlation with psychological well-being in a similar study conducted among individuals with psychological

disorders (Björgvinsson et al., 2013). Furthermore, Williams, Ying-Li, and Hay (2020) demonstrated that the CESD-10 exhibited robust internal reliability, excellent validity, and high sensitivity and specificity in assessing post-stroke individuals. In their study, the CESD-10 scale demonstrated strong internal consistency and high reliability, with the scale items exhibiting a Cronbach's alpha coefficient of 0.84. Also, validity was confirmed by testing its association with related measures of psychological distress and depression, including the Kessler (K-10) Psychological Distress scale (Kessler et al., 2002) and respondents' reports of diagnosed depression. Both were positively and statistically significantly associated with scores on the CESD-10 Scale. Specifically, the CES-D-10 Scale showed a Pearson's correlation coefficient of 0.286 ( $p < .001$ ) with the K-10 scale and 0.193 ( $p < .001$ ) with diagnosed depression, indicating strong and significant relationships. These correlations confirm the CESD-10 scale's validity in measuring depression and related psychological distress.

Table 4.4 reports the correlations evident among the four secondary stressors being studied here. SRH exhibits a moderately strong and positive correlation with SRMH, a slightly weaker but positive correlation with life satisfaction and negative correlation with depression. SRMH displays a moderate and positive correlation with life satisfaction and a moderate and negative correlation with depression. Furthermore, life satisfaction demonstrates a moderately strong and negative correlation with depression, indicating that those reporting higher life satisfaction tend to report lower levels of depression. Notably, all correlations are statistically significant. The fact that they are moderately but not strongly correlated with one another suggests that, although related to one another, they do in fact measure different things.

**Table 4.4: Pearson’s Correlations among Secondary Stressors**

	SRH	SRMH	Life Satisfaction	Depression
SRH	1.000			
SRMH	0.501***	1.0000		
Life Satisfaction	0.358***	0.425***	1.000	
Depression	-0.354***	-0.443***	-0.503***	1.000

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$  (two-tailed test).

### Social Resources

Social resources encompass indicators of structural support such as marital status and social network size as well as indicators of functional social support, and the frequency of engaging in social activities with family and friends (House et al., 1988; Musick and Wilson, 2003; Okun, Stock, Haring, and Witter, 1984; Thoits, 1983; Umberson, Chen, House, and Hopkins, 1996; Wiley et al., 2017). In this study, social resources are assessed in terms of marital status, social network ties and frequency of contact, social support and social participation. Drawing on available data, marital status is assessed based on responses to the question: What is your current marital/partner status? Responses were coded as: 1) Currently married and 2) Not currently married.

To assess network size, the number of informal social ties an individual has was calculated from the following questions: How many children do you have (i.e., living children whom you have given birth to or adopted, living stepchildren, or living children whom are your partner's children)?, 2) How many, if any, living siblings (sisters, brothers) do you have?, 3) How many, if any, other living relatives do you have?, and 4) How many, if any, living friends do you have? Responses to each of the four items were summed in order to come up with an

overall social network size score. The scores obtained range from 1 to 208 (with a mean of 57.21 and a standard deviation of 35.52).

The frequency of contact with others in one's informal social network was assessed based on responses to four questions: "When did you last get together with any of your children (repeated for siblings, friends, and relatives) who live outside of your household?" Responses to each were coded as: 1) Within the last day or two, 2) Within the last week or two, 3) Within the past month, 4) Within the past 6 months, 5) Within the past year and 6) More than 1 year ago. It was measured by reverse-coding the items and then adding scores of the four items (frequency of contact with children, siblings, friends, and relatives) together. This resulted in scores ranging from 4 to 24, with higher scores indicating a higher frequency of contact.

Social support can be defined as the perception that companionship, love, services, and information that one is cared about are available from the people one has in their social network (Sherbourne and Stewart, 1991). It was measured here using a derived variable based on the 19-item Medical Outcomes Study Social Support Survey (MOS-SSS). It assesses how people perceive the social support they receive (Shelbourne and Stewart, 1991; Zanini and Peixoto, 2016). The survey consists of four separate social support subscales (i.e., 8 items assessing emotional/informational support, 4 items assessing tangible support, 3 items assessing affectionate support, and 3 items measuring positive social interaction) as well as a single item reflecting overall functional social support. The items included questions asking participants: if they had someone to confide in, to listen to them, to provide advice and information, someone to help with daily chores, meals, or drive you if needed, if they had someone to show them love and affection, to hug you and make you feel wanted, someone to have a good time with, to do enjoyable things with, and to get together with for relaxation. There were five possible responses

for each item: 1) None of the time, 2) A little of the time, 3) Some of the time, 4) Most of the time and 5) All of the time. According to the developers of the scale, scores for each subscale are obtained by averaging the responses over all items in the subscale, and an overall social support score is obtained by averaging the responses over all 19 items in the questionnaire. These scores are then transformed using a pre-defined formula so that they range from 0 – 100. For the purposes of this study, the overall social support score is used. The higher the score, the higher the perceived level of social support.

The MOS-SSS scale was developed as a reliable and valid multi-item scale that, unlike previous scales, was able to include various aspects and forms of social support. The authors described the development of the scale in a two- year longitudinal study and focused on its multidimensionality, reliability and validity. The strong correlation between social support measures and other variables (e.g., loneliness) provided evidence of the discriminant validity of the four component support measures (Shelbourne and Stewart, 1991). The findings of numerous other studies pointing to the relationship between perceived social support and health outcomes among older adults further validated the scale (Charyton, Elliot, Lu, and Moore, 2009; Costa, Salamero, and Gil, 2007; Nahm, Resnick, and Gaines, 2004; Yu et al., 2014). For example, in a study by Pillemera and Holtze (2015) investigating the association between social support and cognitive functioning in a sample of older adults in the US, the MOS-SSS scale was used, demonstrating high reliability with a Cronbach's alpha of 0.96. In addition, in a sample of Malaysian community-dwelling older adults, the MOS-SSS scale exhibited high reliability (Cronbach's alpha = 0.79) and validity (strong correlation with other social support questionnaires) (Din, Adnan and Milhat, 2020). Also, when used with older adults with cancer (Hurrai et al., 2016), it demonstrated strong reliability, as evidenced by a standardized Cronbach

alpha coefficient of 0.95 and high test-retest reliability with a Spearman coefficient of 0.86. This scale also showed high reliability in the current CLSA dataset, with a Cronbach's alpha coefficient of 0.96.

Social participation usually refers to engagement in activities either with people belonging to one's intimate social network or within one's community. Social participation in the community provides a feeling of belongingness (Lin, Ye and Ensel, 1999). In this study, social participation is measured using a CLSA derived variable based on the frequency of respondents' participation in several social or community related activities in the last 12 months. These activities included: 1) family or friendship based activities (e.g., small get-togethers, meals outside of the household, weddings, or reunions), 2) Church or religious activities (e.g., services, committees or choirs), 3) Sports or physical activities with other people, 4) Educational and cultural activities involving other people (e.g., attending courses, concerts, plays, or visiting museums), 5) Service club or fraternal organization activities (e.g., Lion's Club, Rotary, Kiwanis Club, Royal Canadian Legion, or Foresters), 6) Neighbourhood, community or professional association activities, 7) Volunteer or charity work and 8) Any other recreational activities involving other people (e.g., hobbies, gardening, poker, bridge, cards, and other games). In the CLSA, these items were combined into a summary measure. Responses were coded as: (0) Did not participate in any community-related social activity, (1) Participated in a community-related social activity at least once a year, (2) Participated in a community-related social activity at least once a month, (3) Participated in a community-related social activity at least once a week, and 4) Participated in a community-related social activity at least once a day.

Table 4.5 reports the correlations obtained among the five measures of social resources included in this study. All the correlations are statistically significant. However, they tend to be

relatively weak to moderate in magnitude, suggesting that the measures are in fact distinct. Marital status is weakly but negatively correlated with most other measures, with those who were not currently married reporting smaller informal networks, less frequency of contact with those in these networks, as well as lower levels of social support and social participation. Overall social network size demonstrates a weak yet positive correlations with frequency of contact with others in their social network, with social support, and with social participation. Similarly, frequency of contact displays a weak although positive correlation with social support and social participation. Lastly, social support shows a weak positive correlation with social participation.

**Table 4.5: Correlations among Social Resource Measures**

	Network Size	Frequency of Contact	Marital Status	Social Support	Social Participation
Network Size	1.0000				
Frequency of Contact	0.147***	1.000			
Marital Status	-0.039***	-0.028***	1.0000		
Social Support	0.096***	0.158***	-0.382***	1.0000	
Social Participation	0.051***	0.138***	-0.056***	0.215***	1.0000

Note: \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$  (two-tailed test).

### Control Variables

A number of social location and health factors are included as control variables. They include age, religious affiliation, urban /rural residence, language, CLSA study cohort and chronic illness. Previous studies (Brunner et al., 2017; Hill et al., 2020; Hsu, 2007; Lin et al., 2015; Orsholits et al., 2022; Yeager et al., 2006; Zhang, 2011) have found these variables to be related to cognitive functioning in later life. Age is measured in years. Urban/rural residence is a dichotomous measure comparing those: 1) residing in urban areas to those 2) residing in rural areas. Religion is also dichotomous and compares: people with a religion and people with no

religion. Language is measured in two groups: 1) those reporting that English is the language most often spoken at home and 2) a language other than English is most often spoken at home. The cohort variable includes the two sub-cohorts that were included in the CLSA survey: 1) the Tracking cohort and 2) the Comprehensive cohort. Finally, chronic illness is measured based on whether the respondents reported having one or more chronic conditions. Specifically, the respondents were asked if a doctor had ever told them that they had any one of over 50 different chronic conditions, including heart disease cancer, and so forth. For this study, the responses were coded into two categories: 1) Yes, has a chronic illness and 2) No, does not have a chronic illness.

### **4.3 Analytic Approach**

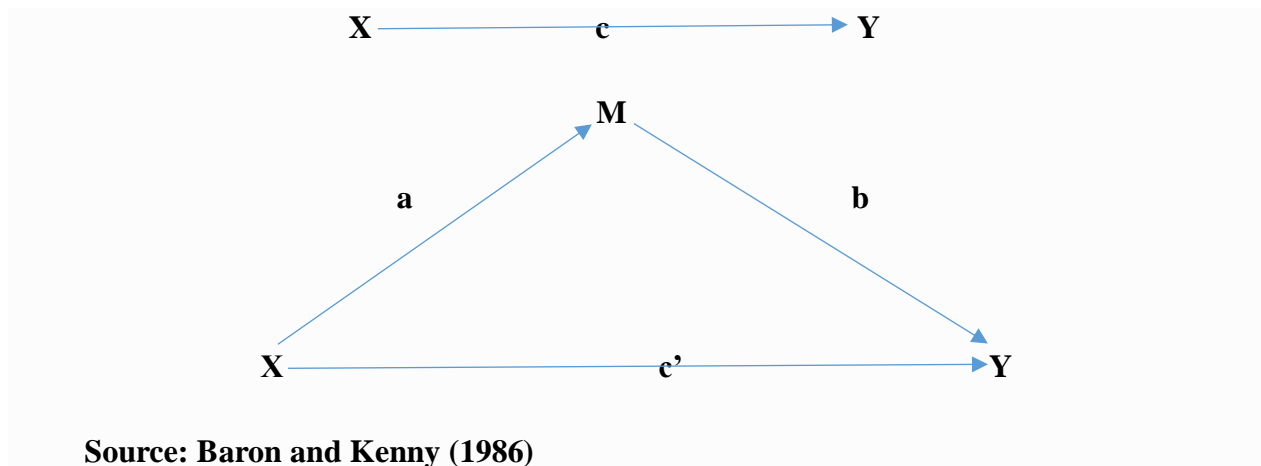
The analytic approach used in this study includes univariate and bivariate analyses followed by ordinary least squares (OLS) regression with survey weights using STATA 15.1 software. As OLS is a well-known approach when the dependent variable is a continuous variable, it was chosen for this study. Also, several previous studies (e.g., Ciaralli, Deimling and Burnham, 2022; Lin and Liu, 2021) have used OLS regression techniques for assessing the mechanisms involved in understanding racial differences in health.

The Baron-Kenny causal steps approach (Baron and Kenny, 1986) and the Sobel test (Sobel, 1982), both well-established methods for evaluating mediating effects, were employed to test the mediating influences of stressors and social resources. According to the Baron-Kenny approach (Figure 4.1), OLS regression analyses require that four conditions need to be met to support mediation: 1) the independent variable should exhibit an influence on the dependent

variable in the initial equation ( $X \rightarrow Y = c$ ), 2) there must be evidence of the independent variable affecting the mediator in the second equation ( $X \rightarrow M = a$ ), 3) the mediator should demonstrate an effect on the dependent variable in the third equation ( $M \rightarrow Y = b$ ), and 4) the effect of the independent variable on the dependent variable should decrease in the third equation when the mediator is taken into account ( $X \rightarrow M \rightarrow Y = c'$ ). Perfect mediation is achieved when the independent variable no longer has any significant effect on the dependent variable once the mediator is controlled for. If the independent variable still has an effect but the effect is reduced when the mediator is controlled for, then it is referred to as partial mediation.

A significance test introduced by Sobel (1972) is used to assess the indirect effect of the independent variable on the dependent variable through the mediator. The Sobel test offers a straightforward and formal statistical method to assess mediation effects in research studies. Furthermore, the Sobel test provides estimates of standard errors, enhancing the reliability of the results (Preacher and Hayes, 2004). One limitation of the Sobel test is its reliance on large sample sizes. However, given the ample size of the sample utilized in this study, the Sobel test can be employed without encountering this limitation. Another limitation of the Sobel test is its reliance on the assumption of normality for the sampling distribution of the mediated effect (Mackinnon et al., 2002). However, given the large sample size utilized in this study, this assumption may be more reasonable, though caution should still be exercised in its interpretation.

**Figure 4.1: Baron-Kenny Four Steps Approach**



### **Model Assumptions**

OLS regression analyses are based on assumptions regarding linearity, normality, heteroscedasticity, and multicollinearity.

#### *Linearity and Normality*

Linear regression analysis assumes that there is a linear relationship between the independent and dependent variables. In order to test the linearity of all continuous independent variables with the four dependent variables, scatterplots were assessed. All of the relationships appeared to be linear.

To test the normality assumption, skewness and kurtosis statistics were examined (Hair Jr et al., 2010; Kline, 2011; Tabachnick and Fidell, 2013). There is no definitive rule about the ranges of skewness and kurtosis that are considered acceptable as different methodologists express different opinions. Although a normal distribution is expected to have skewness and kurtosis values of zero (as stated by Field, 2009 and Malhotra, 2008), there may still be cases where this is not true. Some methodologists (George and Mallery, 2010; Khan, 2015) have found

skewness values between -2 and +2 to be acceptable. According to Hair et al. (2010) and Bryne (2010), data can be considered to be normally distributed if skewness falls within the range of -2 to +2 and its kurtosis falls within the range of -7 to +7. Also, Curran et al. (1996) and Kline (2011) suggest that a problem may only arise when skewness is greater than 3 and kurtosis is greater than 10. Tabachnick and Fidell (2013) argue that when sample size is over 200, deviations from normality do not affect the analysis substantially.

As this study used a sample size of over 50000, the skewness range of -2 +2 and kurtosis range of -7 to + 7 has been applied for the analyses (see Appendix B). All continuous variables fell within this range. Other normality tests (i.e., the Shapiro-Wilk normality test and the Shapiro-Francia normality test) have been applied but the results are not taken into account as for a larger sample size, these normality tests always show significant results whenever there is a deviation from zero (Demir, 2022; Lumley et al., 2002; Wilcox, 2010).

### *Heteroscedasticity*

The homoscedasticity assumption in OLS requires that variance in the error terms or residuals in the regression analyses should be constant. Heteroscedasticity arises when the variance is not constant which causes misleading inferences, less precise estimates and p-values that are smaller than they should be (Astivia and Zumbo, 2019). Nevertheless, it has been noted that even under heteroscedasticity, “the usual OLS regression estimator of the partial regression coefficients is unbiased and strongly consistent (White, 1980)” (Hayes and Cai, 2007:710).

In order to check for heteroscedasticity in this study, plots of residuals by fitted values were assessed. The assumption of homoscedasticity in regression analyses asserts that the variability or dispersion of the residuals (also referred to as standard errors) remains constant across all values of the independent variables. When this assumption is violated, leading to the

presence of heteroscedasticity, it undermines the validity of statistical tests and inference in regression analysis (Hayes and Cai, 2007). This study revealed a heteroscedastic pattern for models with all four dependent variables (Appendix A).

To address the issue of heteroscedasticity, a method that has been employed in this context is the use of heteroskedasticity-consistent standard errors (HCSE). HCSE, also known as robust standard errors or White's standard errors, is a technique that adjusts the standard errors of regression coefficients to account for heteroskedasticity. Standard errors that are obtained by using this method are robust and consistent even when the residuals are heteroskedastic (Long and Ervin, 2000; White, 1980). This method does not assume homoscedasticity when estimating models using ordinary least squares regression. By employing HCSE, regression analyses can maintain their validity even in the presence of heteroskedasticity. Therefore, HCSE was employed in this study.

### *Multicollinearity*

Multicollinearity exists whenever an independent variable is highly correlated with one or more of the other independent variables in a multiple regression equation. It is a problem as when two independent variables exhibit a strong correlation with each other, it is unlikely for either of them to be statistically significant, despite their high correlation with the dependent variable (Schroeder, Sjoquist and Stephan, 2017). The inaccuracy of the estimates as well as the standard errors also increase if the assumption of non-collinearity is violated (Miles and Shelvin, 2001). It also makes it difficult to accurately determine the effect of each factor on the outcome variable in a statistical model. Furthermore, it can both widen the Confidence Interval (CI) and produce skewness which makes the findings unreliable (Srestha, 2020).

Table 4.6 displays the correlations among all the independent variables. All variables exhibit either weak or moderate correlations with each other. In order to evaluate multicollinearity, the variance inflation factors (VIFs) of a model that includes all variables were assessed (Appendix C). This model did not show any multicollinearity issues. A review of the literature indicates that while variance inflation factors ranging from 1 to 5 suggest some correlation, factors ranging from 5.0 or 10.0 and above indicate a multicollinearity problem (Lin, 2008; O'Brien, 2007). Here, almost all variables except for the interaction terms had values less than 2. Nevertheless, interaction terms are anticipated to exhibit elevated VIFs as stated by Allison (2012b).

**Table 4.6: Correlations among all Independent Variables**

	Race	Gender	Immigrant status	Age	Urban/Rural	Religion	Chronic Illness	Cohort	Education	Household Income	Home-ownership
Race	1.000										
Gender	-0.023	1.000									
Immigrant Status	0.267	-0.037	1.000								
Age	-0.066	-0.021	0.085	1.000							
Urban/Rural	0.041	0.003	0.057	0.030	1.000						
Religion	-0.010	-0.090	0.069	-0.099	0.036	1.000					
Chronic Illness	-0.020	0.064	0.002	0.186	0.018	-0.018	1.000				
Cohort	0.035	-0.004	0.068	-0.010	0.201	0.050	0.022	1.000			
Education	0.027	-0.013	0.075	-0.165	0.059	0.082	-0.038	0.099	1.000		
Household Income	-0.016	-0.119	0.008	-0.302	0.042	0.103	-0.094	0.096	0.283	1.000	
Homeownership	0.029	0.037	-0.021	0.051	0.103	-0.027	0.042	0.036	-0.116	-0.345	1.000
SRH	0.038	-0.025	-0.013	0.031	0.006	-0.033	0.162	-0.041	-0.132	-0.221	0.140
SRMH	-0.008	-0.031	0.014	0.041	-0.015	-0.001	-0.103	-0.019	0.089	0.175	-0.111

Life Satisfaction	-0.041	-0.017	-0.011	0.077	-0.050	-0.039	-0.072	-0.051	0.057	0.246	-0.202
Depression	0.0226	0.088	-0.005	-0.035	0.014	0.000	0.098	-0.004	-0.074	-0.197	0.145
Marital Status	-0.005	0.182	-0.033	0.114	0.075	-0.015	0.050	0.028	-0.059	-0.438	0.331
Network Size	0.047	0.057	-0.125	-0.130	-0.069	-0.098	-0.038	-0.107	-0.031	0.018	-0.020
Frequency of Contact	-0.055	0.099	-0.163	-0.095	-0.026	-0.083	-0.020	0.024	0.001	0.085	-0.093
Social support	-0.047	0.009	-0.020	-0.046	-0.053	-0.014	-0.042	-0.056	0.068	0.274	-0.208
Social Participation	0.006	0.069	0.021	0.036	0.023	-0.037	-0.001	0.063	0.099	0.102	-0.076

**(Table 4.6 continued)**

	SRH	SRMH	Life Satisfaction	Depression	Marital Status	Network Size	Frequency of Contact	Social Support	Social Participation
SRH	1.000								
SRMH	-0.502	1.000							
Life Satisfaction	-0.364	0.439	1.0000						
Depression	0.363	-0.455	-0.514	1.000					
Marital Status	0.086	-0.104	-0.234	0.156	1.000				
Network Size	-0.024	0.048	0.077	-0.052	-0.040	1.000			
Frequency of Contact	-0.060	0.055	0.100	-0.071	-0.031	0.147	1.000		
Social support	-0.201	0.270	0.416	-0.363	-0.387	0.093	0.157	1.000	
Social Participation	-0.161	0.126	0.181	-0.150	-0.059	0.053	0.139	0.215	1.000

## **Additional Procedures**

### *Weighting*

Weighted analyses are necessary when working with survey data, as they account for biases introduced by the sampling design. To enhance the generalizability of the findings to the

larger population of adults in Canada aged 45-85, the CLSA data were weighted prior to analysis. The CLSA database contains two types of weights: inflation weights and analytic weights. Inflation weights are appropriate for estimating descriptive parameters of the finite study population, such as means, proportions, and totals. Analytic weights are survey weights that are adjusted based on the sample sizes within geographic strata, and they are derived by rescaling the inflation weights (Raina, Wolfson, Kirkland and Griffith, 2020). Analytic weights ensure that statistical analyses, such as regression, are representative of specific sub-groups within the population of interest, such as provinces. Therefore, in this study, inflation weights are used for descriptive statistics and analytic weights are used for regression analyses in accordance with CLSA guidelines.

#### *Missing Data Strategy*

Out of the sample of 51,336 participants included in the CLSA, there were no missing cases on age or gender. Furthermore, the majority of variables exhibited a minimal proportion of missing data, ranging from less than 1% to 4%. However, the four dependent variables (Rey-I, Rey-II, MAT and AFT), income and frequency of network contacts showed missingness ranging from 6% (income) to 27% (frequency of contacts). During the process of data collection, it is possible to encounter three distinct types of missing data: 1) MCAR (Missing Completely at Random): This means that the missing data appears random and doesn't show any pattern or relationship to other variables; 2) MAR (Missing at Random): In this case, the missingness of data can be predicted or linked to other variables in the dataset, even though there are differences between participants with complete data and those with incomplete data; and 3) NMAR (Not missing at random): Here, the missing data are not random and cannot be predicted from other variables. The first two categories of missing data (i.e., missing completely at random and

missing at random) are considered "ignorable" as the missingness is random or predictable from other variables in the dataset. However, the third category of missing data, (i.e., missing not at random) is not considered "ignorable" as the missingness is non-random and not predictable from other variables, indicating a potential bias in the data (Bennett, 2001).

Instead of utilizing listwise deletion or single imputation techniques, this study employed multiple imputation (MI) methods to address missing data. The goal of MI is to address the uncertainty associated with the missing data by generating multiple plausible imputed datasets and combining the findings obtained from each of them. Multiple imputation typically follows a three-phase approach. In the first phase, the missing data values are estimated to create a complete dataset. This imputation process is repeated multiple times to generate N number of datasets each with different estimates for the missing values. In the second phase, each of these imputed datasets is analyzed using the chosen statistical method, such as linear regression modeling. Finally, the parameter estimates obtained from the analysis phase are brought together to derive results that are adjusted to address the uncertainty stemming from the missing data (Stern et al., 2009).

A Markov Chain Monte Carlo (MCMC) technique is a widely used algorithm of MI that improves parameter estimates by starting with an initial value for the missing data and repeatedly generating new values for the missing data based on the current values and the observed data (Takahashi and Ito, 2014). Another well-known method for handling missing data is "MICE" or Multiple Imputation with Chained Equations. Granberg-Rademacker (2007) compared three approaches for dealing with missing values (listwise deletion, MCMC and MICE) under three different conditions. He found that MICE performed best as the other two techniques generated biased estimates. Also, MICE allows for simultaneous estimation of missing values of all

variable by employing a series of multivariate regression models in a chained manner, making it a powerful technique for imputing missing data. Another strength of this approach is its adaptability to various data types, including continuous, binomial, ordinal, and nominal data, as well as its ability to ensure each variable has the correct error structure that helps to obtain correct parameter estimates (Azur et al., 2011). Therefore, this approach was employed to handle missing values in this study.

#### **4.4 Summary**

In summary, this chapter offered a comprehensive overview of the study's methodology. It provided insights into the research design and methodology, including the sampling process, the selection of variables and measurement techniques, and data analytic strategies. The chapter also addressed some of the main challenges or issues that emerged during the analysis phase and explained how they were addressed. By encompassing these elements, the chapter increases transparency in the research process. The following chapter details the results of the analyses conducted using a combination of descriptive and inferential statistical methods. These results shed light on the research questions and contribute to a better understanding of the phenomenon under investigation.

# CHAPTER FIVE

## FINDINGS

### 5.1 Descriptive Statistics

Table 5.1.1 provides a description of the variables utilized in the regression analyses for the sample as a whole (weighted). A standard practice in assessing individual cognitive function domains involves setting a cut-off score at 1 standard deviation below the mean as an indicator of low test performance (Sachdev et al., 2014; Stricker et al., 2020). Therefore, the cut-off score is obtained by subtracting the standard deviation from the mean. The mean score for the first cognitive test (Rey-I) is 5.70 out of 15 and the standard deviation (SD) is 2.23. Therefore, the cut-off score is 3.48, resulting in 6.65% showing low cognitive performance. For the second test (Rey-II), the mean is 4.10 out of 15 and the SD was 2.45. With a cut-off value of 1.65, 11.76% of those surveyed demonstrated low cognitive functioning. The third cognitive test (MAT) yielded a mean score of 24.76 out of 51 and a SD of 9.82, leading to a cut-off score of 14.94. Using this cut-off, 8.88% of the participants could be classified as cognitively impaired. Finally, the fourth test (AFT) revealed an average score of 18.90 out of 50 and a SD of 5.83, resulting in a cut-off score of 13.07. Overall, 10.6% of the participants' scores were lower than that. According to Tuokko et al. (2017; 2020), the performance of CLSA participants in both the Tracking and Comprehensive cohorts on these measures was, in general, similar to that observed in previous studies for those aged 45-85. (pp. 245-6).

With regard to the social positions of primary interest in this study, the vast majority of participants (94.87%) self-identified as white while 5.13% identified themselves as belonging to other racial groups. Females accounted for 51.34% of the sample, while males constituted 48.66%. The majority of respondents (84.62%) identified as non-immigrants and the rest (15.38%) identified as immigrants.

With regard to the control variables, the average age of the participants was 61.23 years. The majority of respondents (79.04%) resided in urban areas while almost 20.96% lived in rural areas. A majority of the respondents (79.89%) reported having some kind of religious affiliation while 20.11% stated that they had no religious affiliation. The majority of respondents (70.85%) indicated that English was their primary language spoken at home, while the remaining respondents (29.15%) reported using other languages at home. Also, 91.47% of the respondents reported experiencing some kind of chronic illness while 8.53% reported having no chronic illness. Overall, 77.88% of the participants in the weighted sample were from the Comprehensive cohort while the rest (22.12%) were from the Tracking cohort.

Socioeconomic status was assessed based on education, income and homeownership. In terms of educational attainment, the mean level of education achieved was 2.93 on a measure ranging from 1 to 4. Overall, 56.27% of the respondents had less than a secondary school level of education, 20.76% had secondary school but no post-secondary education, 14.21% had some post-secondary education, and 8.76% had a post-secondary degree or diploma. With regard to the five income groups, 6.73% of those in the sample reported household incomes of less than \$20,000 annually while one-fourth (25.03%) had incomes between \$20,000 and \$50,000, one-third (34.87%) had incomes between \$50,000 and \$100,000, 18.63% had incomes between \$100,000 and \$150,000, and 14.73% had incomes of \$150,000 or more. The overall mean score

was 2.81, signifying an annual income level of between \$50,000 and \$100,000. Regarding homeownership, 82.58% of the participants owned their dwelling, while 17.42% did not.

Regarding intrapsychic or psychological stressors, more than half of the respondents (56.52%) rated their overall health as excellent or very good, while the remainder (43.48%) described it as good, fair or poor. In terms of perceived mental health, the ratings were even higher. Almost two-thirds of the participants (66.51%) rated their mental health as excellent or very good, while approximately one-third (33.49%) rated it as good, fair or poor. Consequently, the overall mean score (3.83) obtained for self-rated mental health was also somewhat higher than the mean score (2.51) obtained for self-rated health. The average life satisfaction score was 27.24 out of 35, indicating a generally high level of satisfaction with life among the respondents (St. John et al., 2021). Finally, the respondents obtained a mean score of 5.84 on the CESD-10 depression tool, indicating a lower level of depressive symptoms (Satia et al., 2022).

With regard to social resources, the majority (75.78%) of the respondents were currently married at the time of the survey while the rest (24.22%) were not currently married. The average social network size of the respondents was 45.68 on a scale ranging from 1-208. In relation to contact with social network ties, the respondents reported an average frequency of contact of 17.27, measured on a scale ranging from 4 to 24. A score of four refers to infrequent contact (e.g., last seeing children, siblings, relatives and/or friends more than a year ago) whereas a score of 24 refers to a high frequency of contact (e.g., seeing children, siblings, relatives and friends within the last day or two). Regarding social support, the respondents obtained a mean score of 79.76 on a scale ranging from 0 to 100, indicating a relatively high perceived availability of social support (Zhang et al., 2022). Finally, in terms of participation in social activities, the average score was 2.86 on a measure with scores ranging from 0-4. Over 80%

(81.85%) of the respondents engaged in social activities on a daily basis or at least once a week. Among the remaining participants, 15.13% participated monthly, 2.54% participated yearly, and 0.48% did not participate at all.

Table 5.1.2 compares the variables utilized in the regression analyses based on racial status. Overall, across all four cognitive tests, whites obtained higher average scores compared to members of racial minority groups, with average scores of 5.86 for whites versus 5.67 for racial minority group members on the Rey-I, 4.18 for whites and 3.96 for racial minority group members on the Rey-II, 26.07 for whites and 23.32 for racial minority group members on the MAT, and 19.58 for whites compared to 17.83 for racial minority group members on the AFT. All differences were statistically significant ( $p < .001$ ).

In terms of gender, a somewhat greater proportion of the white participants were females (52.06%) compared to racial minority group members (48.22%). In terms of immigrant status, a significantly greater percentage of racial minority group members were immigrants (61.61%) than was the case among whites (11.80%).

With regard to the control variables, there was also a significant age difference, with white participants reporting an average age of 59.96 years, in contrast to the average age of racial minority group members at 56.47 years. In addition, more racial minority group members (89.25%) lived in urban areas compared to whites (77.69%) and a somewhat greater proportion of racial minority group members (19.62%) reported that they had no religious affiliation compared to whites (15.75%). Moreover, more racial minority group members spoke languages other than English at home (29.22%) compared to whites (26.22%). Further, more racial minority group members (10.91%) reported having some kind of chronic illness compared to

whites (9.72%). Also, fewer racial minority group members (65.69%) were from the Comprehensive cohort compared to whites (76.62%).

**Table 5.1.1: Descriptive Statistics for Variables included in the Analyses**

<b>Variables</b>	<b>Mean or Percentage</b>	<b>S.D.</b>
<b>Cognitive Tests</b>		
Rey-I (Range: 0-15)	5.70	2.22
Rey-II (Range: 0-15)	4.10	2.45
MAT (Range: 0-52)	24.76	9.82
AFT (Range: 0-50)	18.90	5.83
<b>Independent and Control Variables</b>		
Race		
White	94.87%	
Racial minority	5.13%	
Gender		
Male	48.66%	
Female	51.34 %	
Immigrant Status		
Non-immigrant	84.62%	
Immigrant	15.38 %	
Age	61.23	10.61
Residence		
Urban	79.04%	
Rural	20.96%	
Religion		
Has a religious affiliation	79.89%	
No religious affiliation	20.11%	
Language		
English	70.85%	
Non-English	29.15%	
Chronic Illness		
No	91.47%	
Yes	8.53%	
Cohort		
Tracking		
Comprehensive	22.12 %	
Comprehensive	77.88%	
<b>Primary Stressors (Socioeconomic Status)</b>		
Education (Range: 1-4)	2.93	1.27
Income (Range: 1-5)	2.81	1.12
Homeownership		
Homeowner	82.58%	
Non-homeowner	17.42%	
<b>Secondary Stressors (Perceived Well-being)</b>		
Self-rated health (Range: 1-5)	2.51	1.02
Self-rated mental health (Range: 1-5)	3.83	0.94
Life satisfaction (Range: 5-35)	27.24	7.04
Depression (Range: 0-30)	5.84	6.86

Social Resources		
Marital Status		
Currently married	75.78%	
Not currently married	24.22%	
Social network size (Range: 1-208)	45.68	32.95
Frequency of contacts (Range: 4-24)	17.27	3.29
Social support (Range: 0-100)	79.76	18.75
Participation in social activities (Range: 0-4)	2.86	0.75

Note: Table reports weighted means or percentages, N=51, 338  
Source: Canadian Longitudinal Study on Aging Baseline Data

In terms of socioeconomic status, several disparities between racial minority group members and whites are evident. Racial minority group members reported a significantly higher average level of educational attainment (3.25) compared to whites (3.08), while the average household income of whites was significantly higher (3.10) than that of racial minority group members (2.97). It is noteworthy that the majority of respondents in both groups had achieved at least some post-secondary education or held a post-secondary degree/diploma, as indicated by average scores above three in educational attainment. In terms of income, the majority of those in both groups reported household incomes of between \$50,000 and \$100,000 annually. Regarding homeownership, approximately 20% (19.54%) of racial minority group members did not own a home, while the percentage (13.88%) was somewhat lower for whites.

In relation to secondary stressors, participants from racial minority groups reported a mean self-rated health score (3.48) slightly but significantly below the average score reported by their white counterparts (3.67). On the scale ranging from 1 to 5, where a score of 3 signifies 'good' SRH and a score of 4 denotes 'very good' health, on average, whites more often rated their health at the 'very good' level, while racial minority group members more often rated it above the 'good' level. Similarly, for self-rated mental health, the average score reported by white participants (3.92) was significantly higher than the mean score obtained for racial minority group members (3.86). On average, however, both groups rated their mental health close to the 'very good' level

on the same scale. Additionally, in terms of self-rated life satisfaction, racial minority groups had an average score (3.86) slightly but significantly below the average score reported by whites. On the scale ranging from 5 to 35, where a score of 26 or above signifies relative 'satisfaction' (St. John et al., 2021), both groups expressed satisfaction with their lives but whites expressed somewhat greater satisfaction (27.80) compared to racial minority group members (26.47).

**Table 5.1.2: Comparison of Variables between Whites and Racial Minorities**

Variables	White (N=48,763) Mean/percentage	Visible Minorities (N=2,507) Mean/Percentage	p-value
<b>Cognitive Tests</b>			
Rey-I (Range: 0-15)	5.86	5.67	0.001
Rey-II (Range: 0-15)	4.18	3.96	0.001
MAT (Range: 0-52)	26.07	23.32	0.001
AFT (Range: 0-50)	19.58	17.83	0.001
<b>Independent and Control Variables</b>			
Gender (Female=1)	52.06%	48.22%	0.01
Immigrant Status (Immigrant=1)	11.80%	61.61%	0.001
Age	59.96	56.47	0.001
Residence (Urban=1)	19.62%	15.75%	0.03
Religion (No religious affiliation=1)	77.69%	89.25%	0.001
Language (Non-English=1)	26.22%	29.22%	0.001
Chronic Illness (Yes=1)	9.72%	10.91%	0.244
Cohort (Comprehensive=1)	76.62%	65.69%	0.001
<b>Primary Stressors (Socioeconomic Status)</b>			
Education (Range:1-4)	3.08	3.25	0.001
Income (Range: 1-5)	3.10	2.97	0.001
Homeownership (Non-homeowner=1)	13.88%	19.54%	0.001
<b>Secondary Stressors (Perceived Well-being)</b>			
Self-rated Health (Range: 1-5)	3.67	3.48	0.001
Self-rated Mental Health (Range: 1-5)	3.92	3.86	0.003
Life Satisfaction (Range: 5-35)	27.80	26.47	0.001
Depression (Range: 0-30)	5.21	5.92	0.001
<b>Social Resources</b>			
Marital Status (Not Currently Married=1)	31.42%	29.13%	0.02
Social Network Size (Range: 1-208)	56.99	61.25	0.001
Frequency of Contacts (Range: 4-24)	17.72	16.65	0.001
Social Support (Range: 0-100)	81.96	71.11	0.001
Participation in Social Activities (Range: 0-5)	2.95	2.97	0.001

Note: Table reports weighted % or means, unweighted Ns. Chi Square tests and t tests were used to generate the p values.  
Source: Canadian Longitudinal Study on Aging Baseline Data

Lastly, concerning depressive symptoms, racial minority group members obtained a mean score of 5.92 which was somewhat higher than the average score reported by whites 5.21. As lower scores indicate a lower level of depressive mood, it appeared that on average, both whites and racial minority group members experienced relatively low levels of depressive symptoms. Nevertheless, racial minority group members reported significantly higher levels of depression than whites ( $p < .001$ ).

In terms of social resources, a higher percentage of whites were married or partnered (31.42%) compared to racial minority group members (29.13%). Conversely, the average network size reported by whites was smaller (56.99) compared to that of racial minority group members (61.25). Yet, whites reported more frequent social contacts (17.72) compared to racial minority group members (16.65). In terms of social support, whites also reported significantly higher levels (81.96) compared to their racial minority group counterparts (71.11). Finally, when considering social participation, although the difference in average levels reported by the two groups was small (2.95 and 2.97 for whites and racial minority group members, respectively), this difference was also statistically significant.

## **5.2 Hypothesis 1: People belonging to racial minority groups are likely to demonstrate poorer cognitive functioning during middle and later life compared to their non-minority counterparts.**

The bivariate analyses reported in Table 5.1.2 indicate that whites had significantly higher average scores than members of racial minority groups on all four measures of cognitive functioning included in this study. To see whether this was also the case when control variables

were taken into account, a series of regression analyses estimated the association between racial minority status and performance on each of the four cognitive tests (Rey-I, Rey-II, MAT and AFT) controlling for gender and immigrant status as well as age, rural/urban residence, religion, language spoken at home, chronic illness and cohort membership.

The results indicate that when Rey-I scores were regressed on race, performance was poorer among racial minority group members than whites and the results were statistically significant. In addition, those who were older, individuals who did not speak English at home, those with chronic illnesses, and those who participated in the Comprehensive cohort performed more poorly compared to younger adults, those who spoke English at home, those without chronic illnesses, and those who participated in the Tracking cohort. Conversely, women, those residing in urban areas, and those without religious affiliations demonstrated better cognitive performance, while men, individuals in rural areas and those with a religious affiliation showed poorer performance. With these variables taken into account, the difference between immigrants and non-immigrants was not statistically significant. Together, race and other variables successfully accounted for 14.34% of the overall variance evident in Rey-I scores.

**Table 5.2.1: Ordinary Least Squares Regression: Racial Disparities in Rey-I and Rey-II Cognitive Test Performance (Whites vs. Non-Whites)**

Variables	Rey-I				Rey-II			
	B	SE	t	R <sup>2</sup>	B	SE	t	R <sup>2</sup>
Race (Racial Minority=1)	-0.410***	0.003	- 9.59	0.1434	-0.437***	0.003	-9.02	0.1477
Gender (Female=1)	0.937***	0.018	53.36		1.109***	0.019	56.47	
Immigrant Status (Immigrant=1)	0.331	0.311	1.07		0.245	0.344	0.71	
Age	-0.058***	0.000	-67.62		-0.065***	0.001	-65.97	
Urban/Rural (Urban=1)	0.006*	0.003	2.29		0.009**	0.003	3.16	
Religion (No religious affiliation=1)	0.188***	0.022	8.56		0.219***	0.025	8.92	
Language (Non-English=1)	-0.192***	0.011	-17.70		-0.058***	0.012	-4.74	
Chronic Illness (Yes=1)	-0.122***	0.033	-3.71		-0.136***	0.037	-3.69	
Cohort (Comprehensive = 1)	-0.073***	0.019	-3.96		-0.336***	.020	-16.35	
Intercept	31.953***	0.179***	178.58***		8.233***	0.076***	108.61***	
N	51, 337				51, 337			

Source: Canadian Longitudinal Study on Aging Baseline Data (weighted)  
 \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$  (two-tailed test).

With regard to the Rey-II, the findings (Table 5.2.1) are similar, once again showing that, with other social positions and covariates included in the model, members of racial minority groups performed more poorly than whites. In addition, older adults, people with chronic illness, people who did not speak English at home, and those in the Comprehensive cohort also performed more poorly compared to younger adults, people with no chronic illness, people who spoke English at home, and those who participated in the Tracking cohort. Additionally, women, people who lived in urban areas, and people with no religious affiliation performed better compared to men, people who lived in rural areas, and people with a religious affiliation. Once again, however, the relationship between immigrant status and scores on the Rey-II was not

statistically significant. Overall, these variables accounted for 14.77% of the variance in Rey-II scores.

When the MAT was used as a dependent variable, the results (Table 5.2.2) showed that, after accounting for other social position and control variables, individuals belonging to racial minority groups once again displayed significantly poorer performance than whites. In addition, females, older adults, those not using English at home and individuals with chronic illnesses exhibited comparatively poorer performance when contrasted with males, younger adults, individuals from English-speaking households and those without chronic illnesses. Conversely, urban residents, those without a religious affiliation, and those who participated in the Comprehensive cohort reported better cognitive functioning than did rural residents, those with a religious affiliation and those who were part of the Tracking cohort. Finally, with these variables controlled for, immigrants once again did not differ significantly from non-immigrants. Taken together, these variables accounted for 9.03% of the overall variance evident in MAT scores.

Finally, when the AFT scores were regressed on race as well as the control variables (Table 5.2.2), the findings once again showed that individuals affiliated with racial minority groups demonstrated significantly poorer performance. In addition, women, older adults, those who did not use English as their primary language at home, and those reporting chronic health conditions exhibited relatively poorer performance in comparison to males, younger adults, individuals from English-speaking households and individuals without chronic health issues. Conversely, those with no religious affiliation displayed superior performance compared to individuals reporting having a religious affiliation. Finally, no statistically significant relationships were found between AFT scores and immigrant status or urban residency. Overall,

the variables included in the regression analyses accounted for 16.27% of the overall variance evident in the AFT scores.

**Table 5.2.2: Ordinary Least Squares Regression: Racial Disparities in MAT and AFT Cognitive Test Performance (Whites vs. Non-Whites)**

Variables	MAT				AFT			
	B	SE	t	R <sup>2</sup>	B	SE	t	R <sup>2</sup>
Race (Racial Minority=1)	-3.298***	0.014	-16.65	0.0903	-2.477***	0.008	-21.62	0.1627
Gender (Female=1)	-1.111***	0.082	-13.50		-0.217***	0.047	-4.57	
Immigrant Status (Immigrant=1)	1.364	1.283	1.06		-0.053	0.865	-0.06	
Age	-0.227***	0.004	-58.76		-0.194**	0.002	-82.67	
Urban/Rural (Urban=1)	0.069***	0.012	5.89		-0.003	0.007	-0.37	
Religion (No religious affiliation=1)	1.394***	0.098	14.28		1.310***	0.059	22.33	
Language (Non-English=1)	-0.735***	0.049	-14.82		-0.960***	0.029	-32.70	
Chronic Illness (Yes=1)	-0.484***	0.147	-3.31		-0.180***	0.089	-2.02	
Cohort (Comprehensive = 1)	0.545***	0.086	6.37		0.229***	0.049	4.66	
Intercept	40.219***	0.301***	133.40***		31.953***	0.170***	178.58***	
N	51, 337				51, 337			

Source: Canadian Longitudinal Study on Aging Baseline Data (weighted)  
 \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$  (two-tailed test).

In order to assess racial disparities in cognitive functioning in a more detailed way, the cognitive test performances of several different racial minority groups were compared to those of whites (Tables 5.2.3 and 5.2.4). With regard to the Rey-I, these analyses revealed significantly poorer cognitive performance scores across most racial groups (including blacks, Filipinos, Chinese, South Asians, South East Asians, Arabs, Latin Americans, individuals of other races, and those of multiple races) when compared to whites. However, Koreans, Japanese, and West Asians did not exhibit statistically significant differences in performance. Focusing on the Rey-II

test, somewhat fewer racial disparities emerged. Once again, groups such as blacks, Chinese, South Asians, South East Asians, Latin Americans, and individuals of other races displayed significantly poorer performance relative to whites while Koreans, Japanese, West Asians, did not differ from whites. In addition, however, on this measure, Filipinos, Arabs, and individuals reporting multiple racial affiliations did not differ from whites.

Table 5.2.4 presents the findings obtained when utilizing MAT and AFT scores to evaluate cognitive functioning. With regard to the MAT test, the majority of racial minority groups (including blacks, Filipinos, Chinese, South East Asians, Arabs, Latin Americans, West Asians, individuals of other races, and those of multiple races) once again exhibited significantly poorer cognitive performance compared to whites. However, this was not the case for Koreans, Japanese, and South Asians. Conversely, on the AFT test, all racial minority groups displayed statistically significant poorer performance compared to whites.

In summary, these analyses appear to provide some evidence supporting the hypothesis that people belonging to racial minority groups are likely to demonstrate lower cognitive functioning during middle and later life compared to their non-minority counterparts. This is particularly evident when non-whites are compared, as a single group, to whites. However, when specific racial minority groups are compared to whites, some groups (including blacks, Chinese, South East Asians, , Latin Americans, and other racial minorities) exhibited significantly poorer functioning compared to whites across all four cognitive tests. Meanwhile, other minority groups, such as Filipinos, Koreans, South Asians, Japanese, Arabs, West Asians, and individuals of multiple races, demonstrated significant disparities in

**Table 5.2.3: Ordinary Least Squares Regression: Racial Disparities in Rey-I and Rey-II Cognitive Tests (Whites vs Other Racial Groups)**

Variables	Rey-I				Rey-II			
	B	SE	t	R <sup>2</sup>	B	SE	t	R <sup>2</sup>
Race (White=0)				0.1432				.1470
Black	-.557***	.107	-5.17		-.853***	.125	-6.83	
Korean	-.884	.615	-1.44		-.808	.735	-1.10	
Filipino	-.787***	.233	-3.39		-.482	.257	-1.87	
Japanese	-.189	.285	-0.67		-.122	.332	-0.37	
Chinese	-.326**	.116	-2.81		-.279*	.131	-2.13	
South Asian	-.355***	.107	-3.33		-.460***	.117	-3.95	
South East Asian	-.763**	.286	-2.67		-1.007***	.290	-3.47	
Arab	-.469**	.193	-2.43		-.349	.219	-1.59	
West Asian	-.434	.293	-1.48		-.598	.326	-1.84	
Latin American	-.696***	.172	-4.05		-.544**	.196	-2.77	
Other races	-.548***	.108	-5.07		-.631***	.116	-5.42	
Multiple races	-.173***	.081	-2.07		-.091	.092	-0.99	
Gender (Female=1)	.937***	.017	54.13		1.106***	.019	55.33	
Immigrant Status (Immigrant=1)	.042***	.008	4.97		.050***	.009	5.29	
Age	-.058***	.000	-67.51		-.065	.000	-67.22	
Urban/Rural (Urban=1)	.006***	.002	2.41		.009***	.002	3.27	
Religion (No religious affiliation=1)	.186***	.022	8.30		.216***	.024	8.84	
Language (Non-English=1)	-.189***	.011	-16.94		-.055***	.012	-4.53	
Chronic Illness (Yes=1)	-.115***	.033	-3.49		-.131***	.038	-3.49	
Cohort (Comprehensive=1)	-.042***	.009	-4.65		-.169***	.010	-16.57	
Intercept	9.211***	.062***	146.70***		7.907***	.072***	109.48**	
N	51,337				51,337			

Source: Canadian Longitudinal Study on Aging Baseline Data (weighted)  
 \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$  (two-tailed test).

**Table 5.2.4: Ordinary Least Squares Regression: Racial Disparities in MAT and AFT Cognitive Tests (Whites vs Other Racial Groups)**

Variables	MAT				AFT			
	B	SE	t	R <sup>2</sup>	B	SE	t	R <sup>2</sup>
Race (White=0)				.0883				.1592
Black	-6.101***	.487	-12.52		-4.403***	.289	-15.20	
Korean	-.319	2.794	-0.11		-4.358**	1.667	-2.61	
Filipino	-5.872***	1.113	-5.28		-4.753***	.627	-7.58	
Japanese	-1.751	1.299	-1.35		-1.566*	.729	-2.15	
Chinese	-3.394***	.540	-6.28		-2.303***	.323	-7.13	
South Asian	-.082	.464	-0.18		-2.638***	.286	-9.20	
South East Asian	-4.551***	1.101	-4.13		-3.794***	.650	-5.83	
Arab	-5.951***	.866	-6.87		-3.813***	.521	-7.32	
West Asian	-7.283***	1.352	-5.38		-4.958***	.846	-5.86	
Latin American	-9.298***	.778	-11.95		-4.479***	.470	-9.52	
Other races	-2.626***	.453	-5.78		-1.520***	.275	-5.53	
Multiple races	-2.114***	.370	-5.71		-.982***	.216	-4.54	
Gender (Female=1)	-1.107***	.0847	-13.06		-.221***	.047	-4.66	
Immigrant Status (Immigrant=1)	-.029	.041	-0.71		.052*	.024	2.17	
Age	-.228***	.003	-58.24		-.194***	.002	-80.06	
Urban/Rural (Urban=1)	.073***	.011	6.45		1.287***	.059	21.77	
Religion (No religious affiliation=1)	1.379***	.100	13.73		-.001	.006	-0.16	
Language (Non-English=1)	-.703***	.049	-14.08		-.926***	.029	-31.45	
Chronic Illness (Yes=1)	-.551***	.161	-3.42		-.181*	.088	-2.04	
Cohort (Comprehensive=1)	.264***	.041	6.42		.108***	.024	4.42	
Intercept	40.926***	.291***	140.55***		32.207***	.172***	186.63	
N	51, 337				51, 337			

Source: Canadian Longitudinal Study on Aging Baseline Data (weighted)  
 \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$  (two-tailed test).

performance across only one, two or three of the four tests. Hence, it remains inconclusive whether racial minority groups consistently perform poorly in comparison to whites.

### 5.3 Hypothesis 2: Racial minority status will intersect with other social structural locations (e.g., gender, immigrant status) to influence cognitive

## **functioning in middle and later life.**

In order to look at whether racial minority status intersects with other social structural locations (e.g., gender, immigrant status) to influence cognitive functioning, the effects of the interactions of race by gender and race by immigrant status on performance on all cognitive tests were assessed. Additionally, post-estimation analyses were conducted (using the margins command in STATA) to obtain predicted scores for all cognitive tests for different social groups included within these intersections (e.g., white males, racial minority immigrants). Post-estimation analyses were conducted only when the interaction effects were significant.

### **Interaction Effect of Race and Gender on Cognitive Tests**

The interaction effect of race and gender on Rey-I scores was not statistically significant (Table 5.3.1). Conversely, a statistically significant negative interaction was observed between race and gender on the Rey-II (Table 5.3.1). The findings of the post-hoc estimations showed that white females outperformed all other groups (4.724) including white males, males from racial minority backgrounds, and females from racial minority backgrounds (Figure 5.3.1). Racial minority females were predicted to be the second (4.173) highest functioning group with white males predicted to show relatively lower cognitive performance (3.603). Among the groups, racial minority males were predicted to demonstrate the lowest performance (3.268). The findings suggest that the gender differences in Rey-II scores was somewhat greater among whites than among racial minorities.

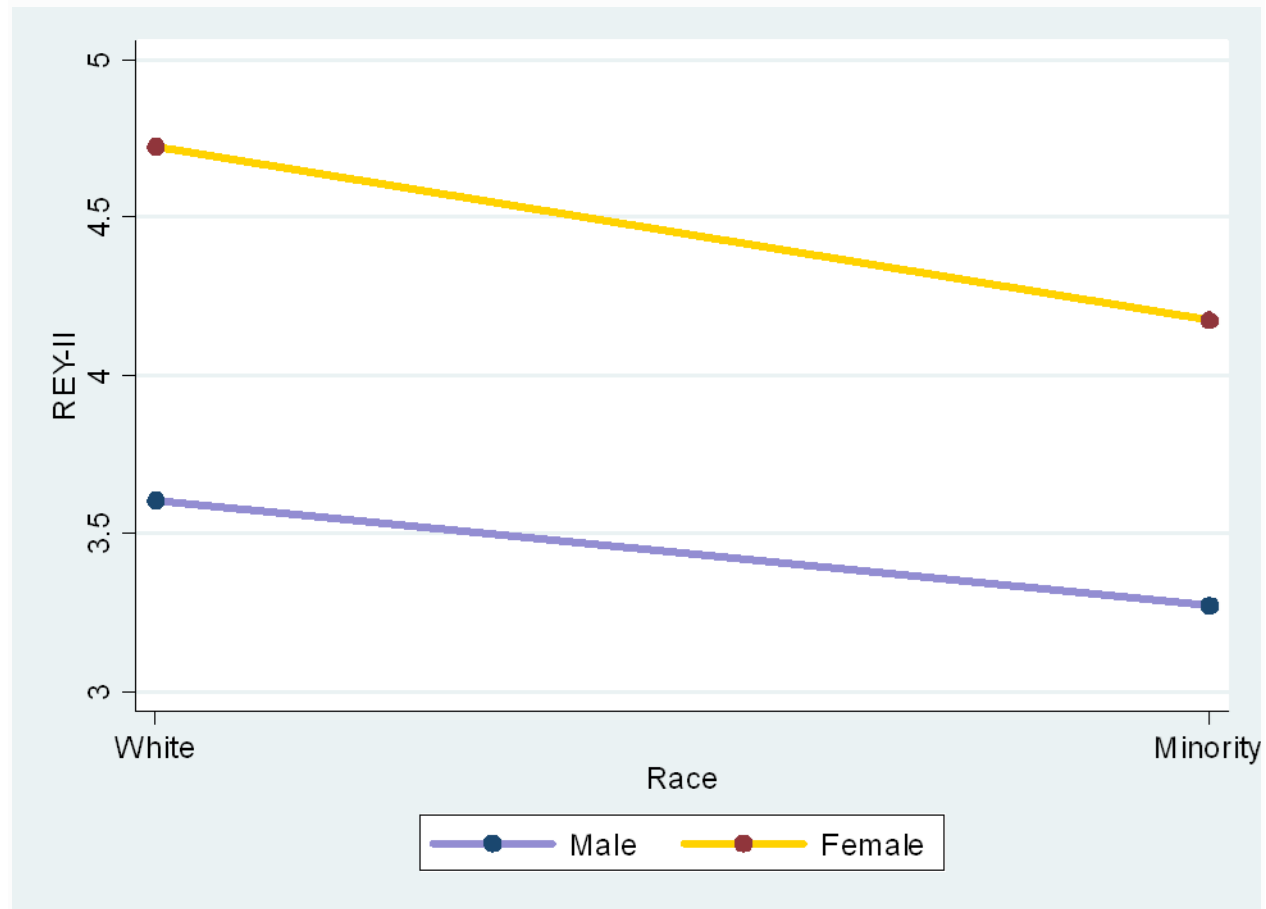
**Table 5.3.1: Interaction Effect of Race and Gender on Rey-I and Rey-II Cognitive Tests**

Variables	Rey-I			R <sup>2</sup>	Rey-II			R <sup>2</sup>
	B	SE	t		B	SE	t	
Race (Racial Minority=1)	-0.374***	0.056	-6.63	0.1467	-0.334***	0.064	-5.27	0.1506
Gender (Female=1)	0.939***	0.018	52.66		1.119***	0.020	55.72	
Immigrant Status (Immigrant=1)	0.037***	0.008	4.41		0.044	0.009	4.63	
Age	-0.058***	0.001	-67.70		-0.065***	0.001	-66.22	
Urban/Rural (Urban=1)	-0.005*	0.003	2.28		0.009***	0.003	3.13	
Religion (No religious affiliation=1)	0.188***	0.022	8.52		0.217***	0.024	8.87	
Language (Non-English=1)	-0.192***	0.011	-17.73		-0.059***	0.012	-4.80	
Chronic Illness (Yes=1)	0.119***	0.033	3.65		0.133***	0.037	3.62	
Cohort	-0.040***	0.018	-4.39		-0.166***	0.010	-16.32	
Race X Gender (ref: White Male)	-0.071	0.081	-0.88		-0.216**	0.091	-2.39	
Intercept	9.193***	0.062***	147.93***		7.897***	0.072***	110.09***	
N	51,337			51,337				

Source: Canadian Longitudinal Study on Aging Baseline Data (weighted)  
 \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$  (two-tailed test).

The interaction effect of race and gender on MAT and AFT scores was not statistically significant (Table 5.3.2). As post-estimation analyses were conducted only when the interaction effects were significant, they were not conducted for analyses of the MAT and AFT cognitive tests.

**Figure 5.3.1: Interaction Effect of Race and Gender on Rey-II Scores**



In summary, the race by gender interaction term was statistically significant for only one of the four cognitive tests (Rey-II). Gender differences in cognitive functioning (REY-II scores) is greater among whites than among racial minorities. The finding that while race and gender showed significant main effects but no interaction effects for the other three cognitive tests introduces an element of inconsistency across the cognitive assessments.

**Table 5.3.2: Interaction Effect of Race and Gender on the MAT and AFT Cognitive Tests**

Variables	MAT			R <sup>2</sup>	AFT			R <sup>2</sup>
	B	SE	t		B	SE	t	
Race (Racial Minority=1)	-3.009	0.252	-11.91	0.0881	-2.431	0.149	-16.23	0.1613
Gender (Female=1)	-1.089***	0.082	-13.16		-0.212***	.049	-4.36	
Immigrant Status (Immigrant=1)	-0.072	0.038	-1.84		0.004	0.023	0.18	
Age	-0.228***	0.004	-56.87		-0.194***	0.002	-82.93	
Urban/Rural (Urban=1)	0.070	0.011	5.98		-0.003	0.007	-0.36	
Religion (No religious affiliation=1)	1.401***	0.097	14.40		1.308***	0.058	22.31	
Language (Non-English=1)	-0.737***	0.049	-15.00		-0.959***	0.029	-32.74	
Chronic Illness (Yes=1)	0.472***	9.145	3.24		0.176*	0.089	1.97	
Cohort	0.275	0.042	6.54		0.113***	0.025	4.61	
Race X Gender (ref: White Male)	-0.634	0.362	-1.75		-0.096	0.219	-0.44	
Intercept	40.769***	0.283***	144.06***		32.177***	0.168***	190.99***	
N	51,227				51,337			

Source: Canadian Longitudinal Study on Aging Baseline Data (weighted)  
 \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$  (two-tailed test).

**Interaction Effect of Race and Immigrant Status on Cognitive Tests**

The interaction effect of race and immigrant status on the Rey-I and Rey-II scores was not statistically significant (Table 5.3.3).

**Table 5.3.3: Interaction of Race and Immigrant Status on the Rey-I and Rey-II Cognitive Tests**

Variables	Rey-I			R <sup>2</sup>	Rey-II			R <sup>2</sup>
	B	SE	t		B	SE	t	
Race (Racial Minority=1)	-0.433***	0.066	-6.53	0.1465	-0.386***	0.072	-5.36	0.1510
Gender (Female=1)	0.931***	0.018	52.12		1.103***	0.019	55.16	
Immigrant Status (Immigrant=1)	0.762	1.122	0.68		0.140***	0.030	4.60	
Age	-0.058***	0.001	-65.24		-0.064***	0.001	-64.48	
Urban/Rural (Urban=1)	0.057***	0.026	2.18		0.091***	0.029	3.10	
Religion (No religious affiliation=1)	0.188***	0.022	8.44		0.221***	0.025	8.90	
Language (Non-English=1)	-0.382***	0.022	-17.22		-0.112***	0.025	-4.46	
Chronic Illness (Yes=1)	-0.119***	0.033	-3.61		-0.143***	0.037	-3.85	
Cohort (Comprehensive=1)	-0.080***	0.019	-3.96		-0.340***	0.021	-16.38	
Race X Immigrant Status (ref: Non-Immigrant White)	0.044	0.085	0.52		-0.084	0.096	-0.83	
Intercept	9.137***	0.058***	156.39		7.901***	0.072***	110.12***	
N	51,337				51,337			

Source: Canadian Longitudinal Study on Aging Baseline Data (weighted)  
 \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$  (two-tailed test)

In contrast with the previous tests, the interaction between race and immigrant status in relation to the MAT attained statistical significance (Table 5.3.4). Therefore, post-estimation analyses (Figure 5.3.2) were conducted which showed this interaction as well. Specifically, the results revealed that among these race-immigrant status groups, white non-immigrants were predicted to emerge as the highest-performing cohort (26.403) which is very close to the

**Table 5.3.4: Interaction of Race and Immigrant Status on the MAT and AFT Cognitive Tests**

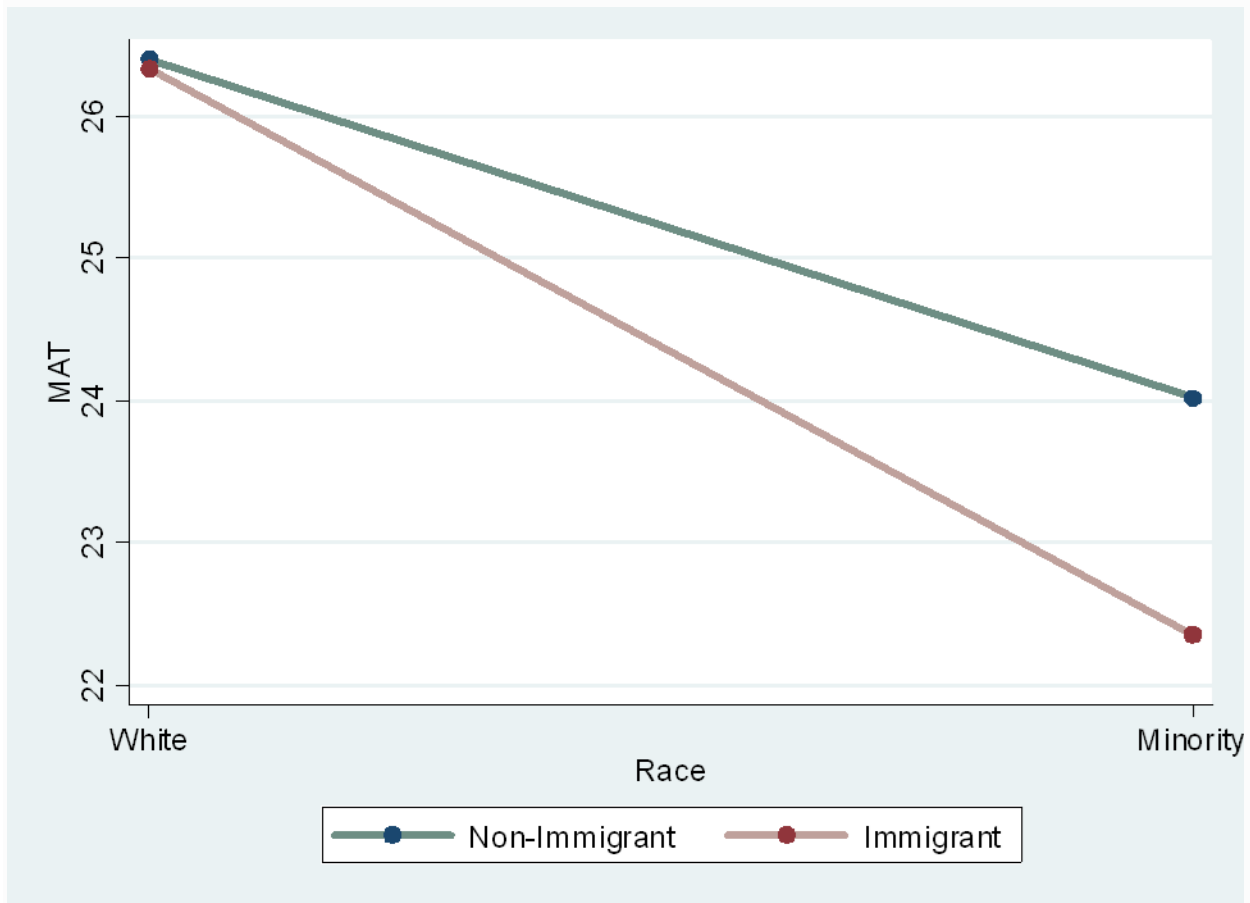
Variables	MAT				AFT			
	B	SE	t	R <sup>2</sup>	B	SE	t	R <sup>2</sup>
Race (Racial Minority=1)	-2.387***	0.298	-8.01	0.0871	-1.014	0.175	-5.80	0.1625
Gender (Female=1)	-1.118***	0.086	-12.99		-0.242***	0.047	-5.06	
Immigrant Status (Immigrant=1)	-0.077	0.122	-0.63		0.249	0.071	3.49	
Age	-0.228***	0.004	-56.87		-0.197***	.002	-82.90	
Urban/Rural (Urban=1)	0.739***	0.119	6.21		-0.006	0.070	-0.09	
Religion (No religious affiliation=1)	1.369***	0.100	13.66		1.289***	0.059	21.68	
Language (Non-English=1)	-1.394***	0.101	-13.69		-1.799***	.059	-30.09	
Chronic Illness (Yes=1)	-0.489***	0.144	-3.38		-0.191*	.088	-2.15	
Cohort (Comprehensive)	0.531***	0.084	6.32		0.227***	.049	4.58	
Race X Immigrant Status (ref: Non-Immigrant White)	-1.559***	0.396	-4.03		-2.551***	0.231	-11.05	
Intercept	40.298***	0.275***	146.35***		31.994***	0.166***	192.69***	
N	51337				51337			

Source: Canadian Longitudinal Study on Aging Baseline Data (weighted)

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$  (two-tailed test).

predicted performance of white immigrants (26.501), outpacing their counterparts: racial minority non-immigrants and racial minority immigrants. Racial minority immigrants were predicted to exhibit lower levels of cognitive performance, with a predicted score of 22.353 compared to racial minority non-immigrants (24.016). Figure 5.3.2 portrays the interaction effect, showing that immigrant status had a greater negative effect on MAT scores among racial minority group members than whites.

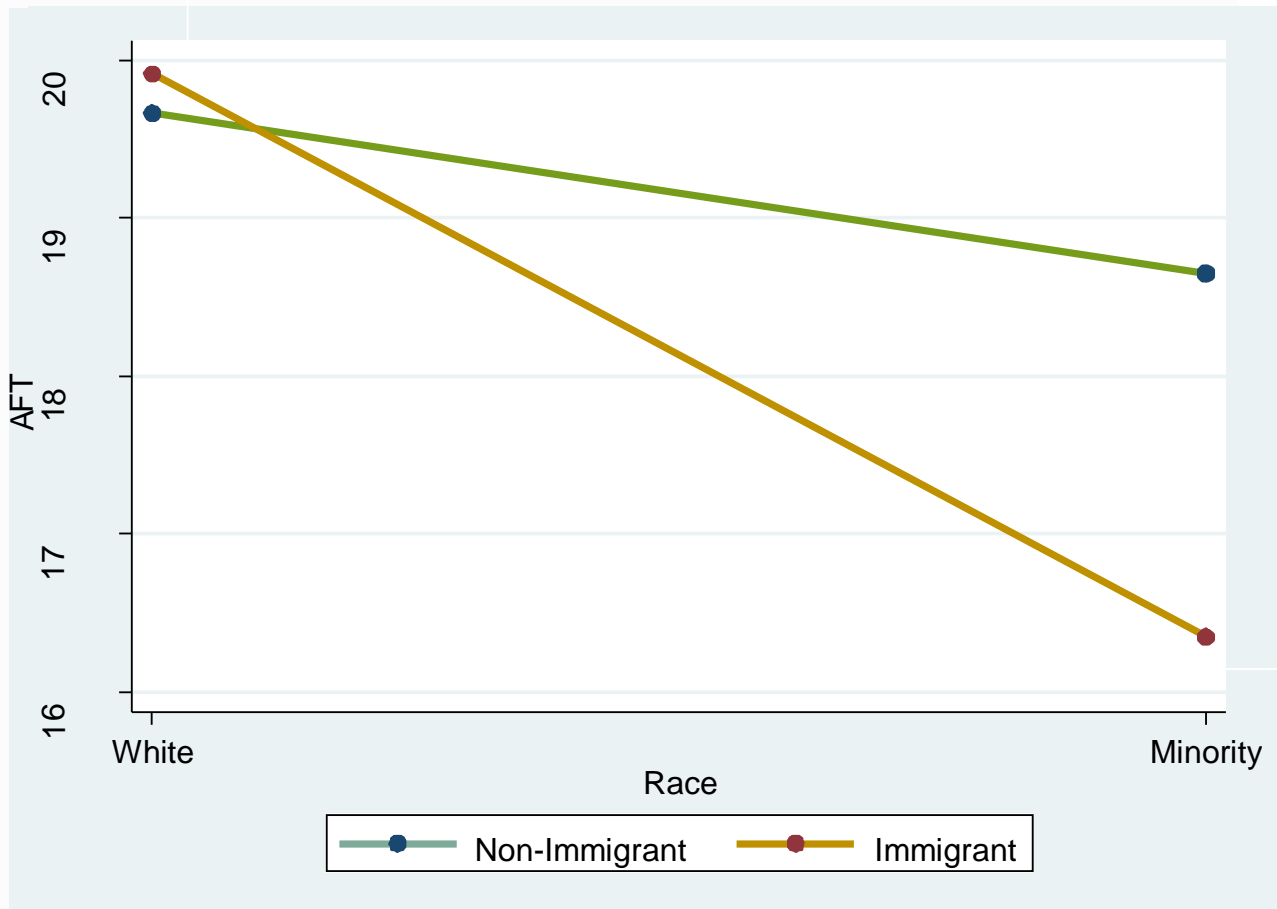
**Figure 5.3.2: Interaction Effect of Race and Immigrant Status on MAT Scores**



The statistical analysis also revealed a significant interaction effect between race and immigrant status in relation to AFT scores (Table 5.3.4). The results, portrayed graphically in Figure 5.3.3, illuminate the differences in cognitive performance across these race-immigrant status groups. White immigrants are predicted to be the top performers (19.912), with scores that are very close to those of white non-immigrants (19.622). They are predicted to outperform racial minority non-immigrants and racial minority immigrants. Notably, the group of racial minority immigrants were predicted to have the lowest AFT scores (16.343) when compared to the other three groups. Similar to the MAT results, Figure 5.3.3 provides evidence of the

interaction effect, suggesting that immigrant status had a greater negative effect on AFT scores among racial minority group members than whites.

**Figure 5.3.3: Interaction Effect of Race and Immigrant Status on AFT Scores**



In summary, the findings partially support Hypothesis 2, indicating that racial minority status intersects with other social structural locations, specifically gender and immigrant status, to influence cognitive functioning in middle and later life. However, this interaction is not consistent across all cognitive tests. The interaction of race with gender exerted a significant influence on only one cognitive test (i.e., the Rey-II which is in the memory domain). Here, the gender difference in cognitive performance was more pronounced among whites than racial

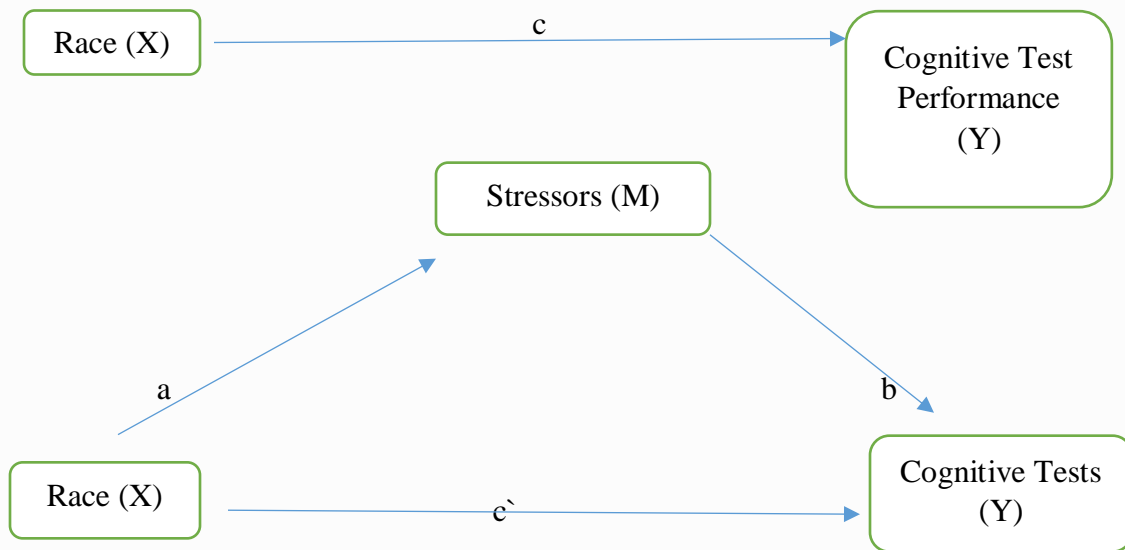
minorities. Concerning the interaction of race and immigrant status, the differences in cognitive functioning between immigrant and non-immigrant individuals were more prominent among racial minorities than whites on at least on two of the four cognitive tests (i.e., the MAT and the AFT which are in the executive functioning domain). Therefore, it can be concluded that when it comes to executive functioning in middle and later life, immigrant status appears particularly problematic for racial minorities. It might also be concluded that the interaction effect is significant for tests in the executive functioning domain but not the memory domain (to be discussed in Chapter 6).

### **5.4 Hypothesis 3: Associations between racial minority status and cognitive functioning will be mediated by differences in exposure to stressors (primary and secondary).**

A series of regression analyses were conducted to analyze the mediating effects of primary stressors (education, income and homeownership) and secondary stressors (self-rated general health, self-rated mental health, life satisfaction, and depression) on the relationship between race and cognitive test performance. Mediation testing (using a separate test for each stressor) was done using the 4-step approach proposed by Baron and Kenny (1986). As noted, this approach suggests that mediation occurs when there is evidence that: 1) race is associated with cognitive test performance (path c in Figure 5.4.1); 2) race is significantly associated with the stressors (path a); 3) the cognitive tests are significantly associated with the stressors (path b) controlling for race; and 4) the relationships between race and the cognitive tests are reduced when stressors are controlled for, leading to, at the very least, partial mediation (ideally there would be no relationship between race and cognitive tests, resulting in a complete mediation)

(path  $c'$ ). In order to confirm that there was mediation, step one is not required but the other criteria must be met. Finally, a Sobel test was used to further confirm if the mediating effect was statistically significant (Sobel, 1982).

**Figure 5.4.1: Baron–Kenny Approach for Testing the Mediating Effect of Stressors on the Relationship between Race and Cognitive Test Performance**



**The Mediating Effect of Primary Stressors on the Relationship between Race and Rey-I Cognitive Test Performance**

***Education as the Mediator***

The results of analyses addressing the mediating effect of education on the relationship between race and performance on the Rey-I cognitive test scores are shown in Table 5.4.1 and Figure 5.4.2. Equation 1 shows that race (X) is significantly and negatively associated with Rey-I scores (Y) ( $b = -0.029, p < .001$ ), with racial minority group members obtaining lower Rey-I scores compared to whites. However, Equation 2 shows the results of the second step indicating

**Table 5.4.1: Mediating Effect of Primary Stressors on the Relationship between Race and Rey-I Scores**

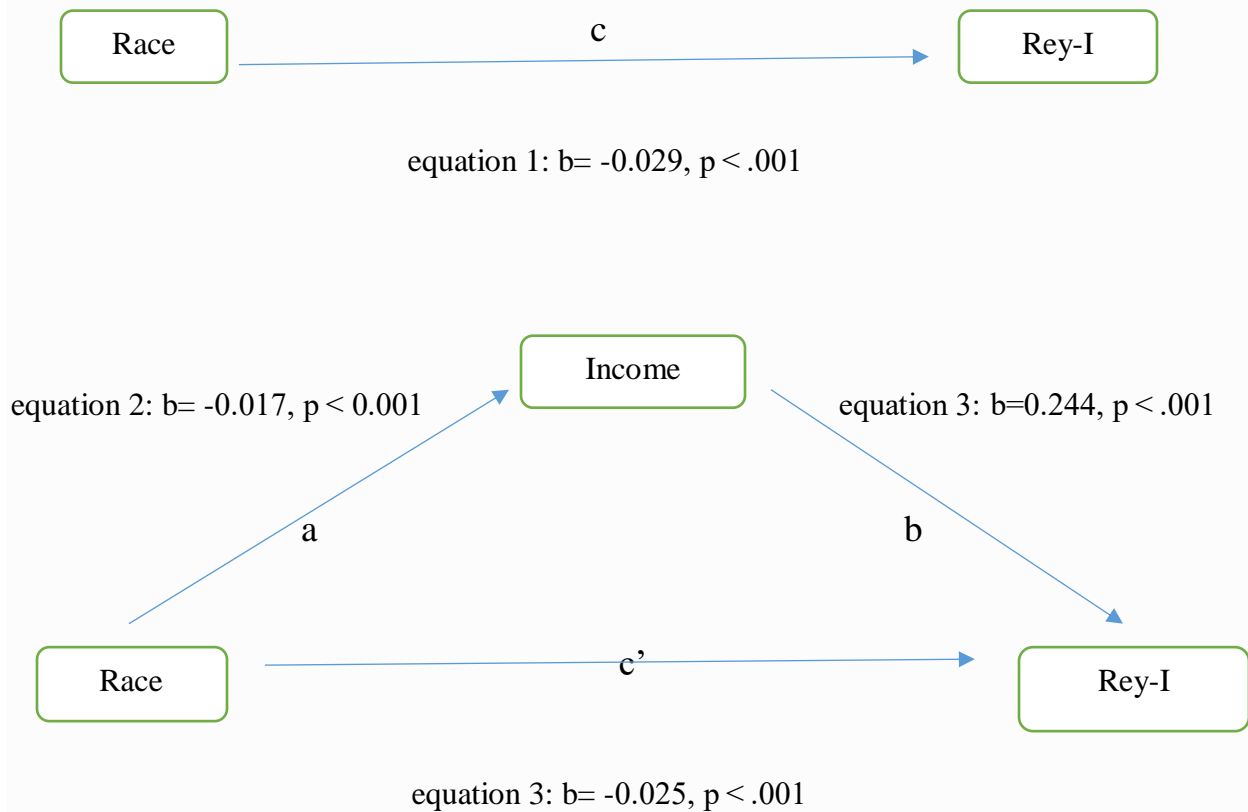
Equations	B	SE	t	F	Sobel Test (z)
<b>Race → Education → Rey-I</b>	-0.029***	0.003	-9.36	917.50 ***	-1.143
Equation 1 (X → Y = c) Race → Rey-I					
Equation 2 (X → M = a) Race → Education	-0.002	0.002	-1.21	323.92 ***	
<b>Race → Income → Rey-I</b>	-0.029***	0.003	-9.36	917.38 ***	-10.370 ***
Equation 1 (X → Y = c) Race → Rey-I					
Equation 2 (X → M = a) Race → Income	-0.017***	0.001	-10.36	1193.47 ***	
Equation 3 (M → Y = b) (Race) → Income → Rey-I	0.244***	0.009	27.32	911.59 ***	
Equation 3 (X → M → Y = c')	-0.025***	0.003	-8.11		
<b>Race → Homeownership → Rey-I</b>	-0.029***	0.003	-9.36	917.46 ***	-7.479 ***
Equation 1 (X → Y = c) Race → Rey-I					
Equation 2 (X → M = a) Race → Homeownership	-0.004***	0.001	6.72	209.65 ***	
Equation 3 (M → Y = b) (Race) → Homeownership → Rey-I	-0.428***	0.025	-16.83	859.29 ***	
Equation 3 (X → M → Y = c')	-0.027***	0.003	-8.88		

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.  
 \*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).  
 Source: Canadian Longitudinal Study on Aging Baseline Data

that the relationship between race (X) and education (M) is not statistically significant (b = -0.002, p > 0.05). Therefore, according to the Baron-Kenny approach, no mediation took place as

the second criterion was not met. A Sobel test further confirmed that there was no mediation as the z score did not reach statistical significance

**Figure 5.4.2: Baron-Kenny Method for Testing the Mediating Effect of Household Income on the Relationship between Race and Rey-I Scores**



***Household Income as the Mediator***

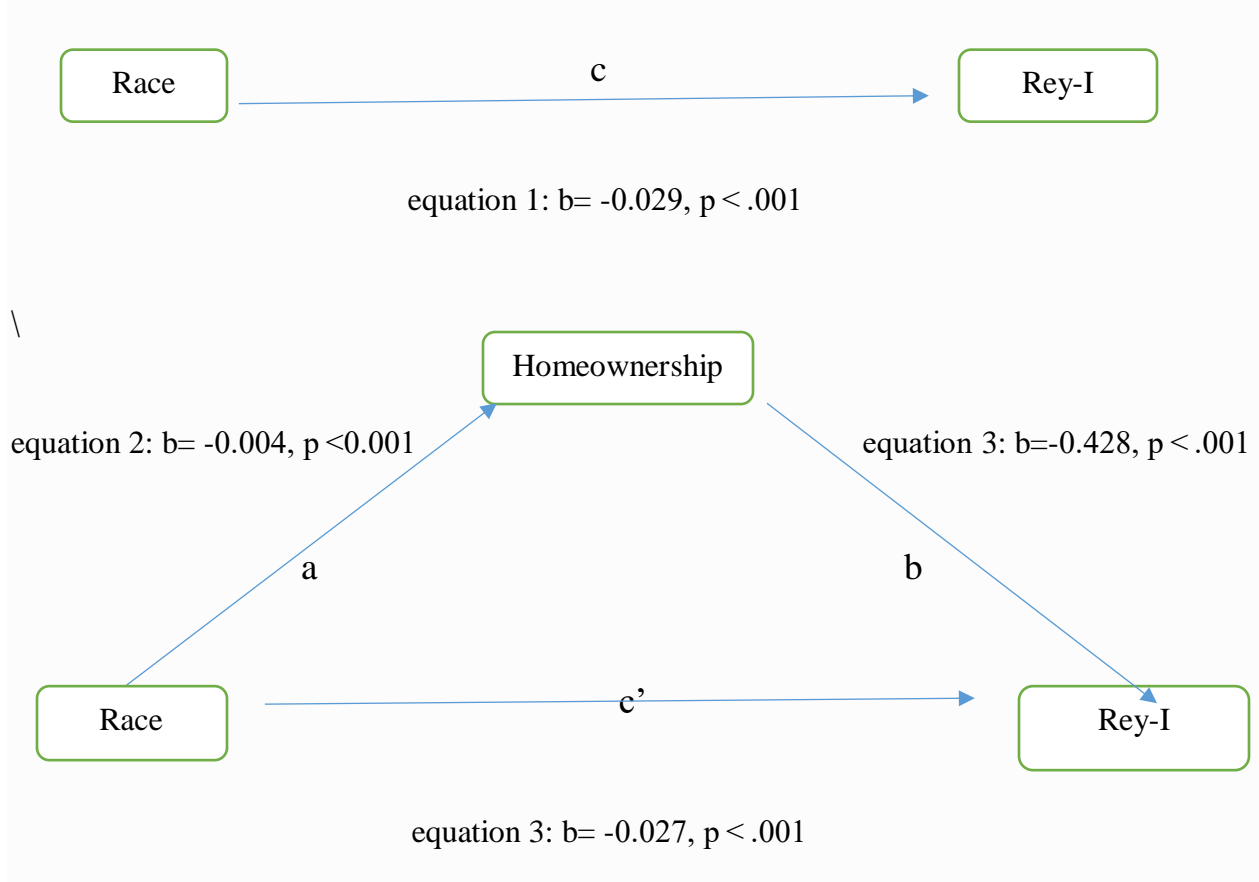
Table 5.4.1 and Figure 5.4.2 present results regarding the mediating role of household income in the connection between race and cognitive test performance on the Rey-I. Advancing to Equation 2, we observe that race is significantly associated with income ( $b = -0.017, p < 0.001$ ), with racial minorities reporting significantly lower incomes than whites. In Equation 3, income (M) significantly affects Rey-I scores (Y) ( $b = .244, p < .001$ ), such that those with

higher incomes achieved higher scores compared to those with lower incomes. Finally, Equation 3 also demonstrates that introducing income (M) as a mediating factor results in a significant reduction in the relationship between race (X) and Rey-I scores (Y) ( $b = -0.025$ ,  $p < .001$ ). This reduction suggests that about 10% of the impact of race on Rey-I scores is accounted for by household income, thereby indicating partial mediation. Confirming this, the Sobel test reaches  $p < 0.001$  ( $z = -10.370$ ), once again affirming the statistically significant mediating role of household income on the relationship between race and Rey-I cognitive test scores.

### ***Homeownership as the Mediator***

When homeownership is included in the analyses, Equation 2 shows that the association between race and homeownership ( $b = -0.004$ ,  $p < 0.001$ ) is statistically significant (Table 5.4.1 and Figure 5.4.3). Racial minorities are significantly more likely to be non-homeowners than are whites. Equation 3 demonstrates that homeownership is also connected with Rey-I scores ( $b = -0.428$ ,  $p < 0.001$ ), with non-homeowners obtaining lower scores than home owners. Finally, also in Equation 3, introducing home ownership leads to a reduction in the relationship between race and Rey-I scores ( $b = -0.027$ ,  $p < .001$ ) and the relationship is statistically significant. After controlling for homeownership, the impact of race on Rey-I scores decreases by approximately 6.3%, indicating partial mediation. The Sobel test, with a p-value of less than 0.001 ( $z = -7.479$ ), confirms the statistically significant mediating influence of homeownership on the connection between race and Rey-I scores.

**Figure 5.4.3: Baron-Kenny Method for Testing the Mediating Effect of Homeownership on the Relationship between Race and Rey-I Scores**



**The Mediating Effect of Primary Stressors on the Relationship between Race and Rey-II Cognitive Test Performance**

*Education as the Mediator*

The results of analyses examining whether and how education mediates the connection between race and cognitive performance based on Rey-II test scores are outlined in Table 5.4.2. As was evident with regard to analyses conducted with Rey-I as an outcome, Equation 1 demonstrates a significant and negative link between race and Rey-II scores ( $b = -0.031$ ,  $p < .001$ ). However, transitioning to Equation 2, it becomes apparent that the association between

race and education is not statistically significant ( $b = -0.001$ ,  $p > 0.05$ ). Hence, following Baron-Kenny's approach, there is no evidence of mediation since the second criterion was not met. Additionally, a Sobel test confirmed the absence of mediation, with the z score ( $z = -1.1211$ ) failing to achieve statistical significance.

### ***Household Income as the Mediator***

The results pertaining to the mediating effect of household income on the relationship between race and cognitive test performance (Rey-II) are presented in Table 5.4.2. Equation 2 once again demonstrates that race is significantly associated with household incomes ( $b = -0.017$ ,  $p < 0.001$ ), with racial minorities reporting significantly lower incomes than whites. Income also displays a significant effect on Rey-II scores ( $b = 0.225$ ,  $p < .001$ ), with higher income levels associated with better cognitive functioning. Lastly, when income is introduced as a mediating factor, the relationship between race and Rey-II undergoes a significant reduction ( $b = -0.027$ ,  $p < .001$ ). Thus, the effect of race is reduced by about 12.4% after accounting for household income, indicating partial mediation. The Sobel test confirms the statistically significant mediating effect of household income on the relationship between race and Rey-II ( $p < 0.001$ ,  $z = -9.469$ ).

### ***Homeownership as the Mediator***

In Table 5.4.2, Equation 2 also underscores a statistically significant association between race and homeownership ( $b = -0.004$ ,  $p < 0.001$ ), such that racial minority group members are less likely to own a home compared to whites. Moreover, Equation 3 emphasizes that homeownership is linked to Rey-II scores with non-homeowners achieving lower scores than

**Table 5.4.2: Mediating Effect of Primary Stressors on the Relationship between Race and**

Equations	B	SE	t	F	Sobel Test (z)
<b>Race → Education → Rey-II</b>	-0.031***	0.003	-8.51	843.04***	-1.211
Equation 1 (X → Y = c) Race → Rey-II					
Equation 2 (X → M = a) Race → Education	-0.001	0.001	-1.21	272.94***	
<b>Race → Income → Rey-II</b>	-0.031***	0.003	-8.51	843.04***	-9.469***
Equation 1 (X → Y = c) Race → Rey-II					
Equation 2 (X → M = a) Race → Income	-0.017***	0.002	-10.36	1078.34***	
Equation 3 (M → Y = b) Income → Rey-II	0.226***	0.009	23.35	824.18***	
Equation 3 (X → M → Y = c') Race → Income → Rey-II	-0.027***	0.003	-7.90		
<b>Race → Homeownership → Rey-II</b>	-0.031***	0.003	-8.51	843.04***	-6.106***
Equation 1 (X → Y = c) Race → Rey-II					
Equation 2 (X → M = a) Race → Homeownership	-0.004***	0.001	6.73	198.46***	
Equation 3 (M → Y = b) Homeownership → Rey-II	-0.415***	0.028	-14.56	789.93***	
Equation 3 (X → M → Y = c') Race + Homeownership → Rey-II	-0.029***	0.003	-8.54		

**Rey-II Cognitive Test Scores**

Note: Analyses adjusted for gender, immigrant status, age, religion, residence, language, chronic illness, cohort  
 \*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).  
 Source: Canadian Longitudinal Study on Aging Baseline Data

homeowners (b= -0.415, p < .001). Lastly, Equation 3 also demonstrates that introducing homeownership leads to a reduction in the relationship between race and Rey-II scores (b= -0.029, p < .001), with this reduction being statistically significant. Accounting for

homeownership, the impact of race decreases by approximately 4.8%, indicating partial mediation. Supporting this, the Sobel test confirms the statistically significant mediating role of homeownership on the relationship between race and Rey-II, with a p-value less than 0.001 ( $z = -6.106$ ).

## **The Mediating Effect of Primary Stressors on the Relationship between Race and the MAT**

### **Cognitive Test**

#### ***Education as the Mediator***

The outcomes of the analysis regarding the mediating impact of education on the link between race and MAT cognitive test performance are presented in Table 5.4.3. In Equation 1, it is evident that race significantly correlates with MAT scores ( $b = -0.225$ ,  $p < .001$ ). Once again, racial minority group members have significantly lower scores than do whites. However, when we move to Equation 2, the relationship between race and education isn't statistically significant ( $b = -0.002$ ,  $p > 0.05$ ). Following the Baron-Kenny approach, we can therefore conclude that no mediation occurred. This conclusion is further validated by the Sobel test, where the z score ( $z = -1.1213$ ) did not achieve statistical significance.

#### ***Household Income as the Mediator***

In Table 5.4.3, advancing to Equation 2, we once again observe that race is negatively associated with household income levels ( $b = -0.004$ ,  $p < 0.001$ ) such that racial minority group members report lower income compared to whites. In Equation 3, income significantly affects MAT scores ( $b = 1.382$ ,  $p < .001$ ): those with higher incomes reveal better cognitive functioning. Finally, Equation 3 also demonstrates that introducing income as a mediating factor results in a

**Table 5.4.3: Mediating Effect of Primary Stressors on the Relationship between Race and MAT Cognitive Test Scores**

Equations	B	SE	t	F	Sobel Test (z)
<b>Race → Education → MAT</b>					-1.213
Equation 1 (X → Y = c) Race → MAT	-0.225***	.014	-15.99	479.30***	
Equation 2 (X → M = a) Race → Education	-0.002	.001	-1.21	291.51***	
<b>Race → Income → MAT</b>					-9.799***
Equation 1 (X → Y = c) Race → MAT	-0.225 ***	.014	-15.99	479.12 ***	
Equation 2 (X → M = a) Race → Income	-0.017 ***	.001	-10.36	1078.35 ***	
Equation 3 (M → Y = b) Income → MAT	1.382 ***	.045	30.22	542.62 ***	
Equation 3 (X → M → Y = c') Race + Income → MAT	-0.202 ***	.014	-14.34		
<b>Race → Homeownership → MAT</b>					-6.225***
Equation 1 (X → Y = c) Race → MAT	-0.225 ***	.014	-15.99	479.06 ***	
Equation 2 (X → M = a) Race → Homeownership	-0.004 ***	.000	6.72	198.36 ***	
Equation 3 (M → Y = b) Homeownership → MAT	-1.888 ***	.114	-16.49	462.81 ***	
Equation 3 (X → M → Y = c') Race + Homeownership → MAT	-0.218 ***	.014	-15.53		

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

reduction in the relationship between race and MAT scores (b= -0.202, p < .001). This reduction suggests that about 10% of the impact of race on MAT scores is accounted for by household income, indicating partial mediation. Confirming this, the Sobel test reaches p < 0.001 (z= -

9.799), affirming the statistically significant mediating role of household income on the relationship between race and MAT scores.

### ***Homeownership as the Mediator***

Regarding homeownership, Equation 2 repeats findings indicating that the association between race and homeownership ( $b = -0.004$ ,  $p < 0.001$ ) is statistically significant (Table 5.4.3). Equation 3 demonstrates that homeownership is also negatively associated with MAT scores ( $b = -1,888$ ,  $p < 0.001$ ) indicating that those who do not own a home obtain lower scores compared to those who do own a home. Finally, also in Equation 3, introducing homeownership into the equation leads to a significant reduction in the relationship between race and Rey-I scores ( $b = -0.218$ ,  $p < .001$ ). The Sobel test, with a p-value less than 0.001 ( $z = -6.225$ ), confirms the statistically significant mediating impact of homeownership on the link between race and MAT scores.

## **The Mediating Effect of Primary Stressors on the Relationship between Race and AFT Cognitive Test Scores**

### ***Education as the Mediator***

The results of the analyses addressing the mediating effect of education on the relationship between race and performance on AFT cognitive test scores are shown in Table 5.4.4. Equation 1 shows that race is significantly and negatively associated with AFT scores ( $b = -0.165$ ,  $p < .001$ ), with racial minorities reporting significantly lower scores than whites. However, Equation 2 shows that the relationship between race and education is not statistically significant ( $b = -0.002$ ,  $p > 0.05$ ). Therefore, according to Baron-Kenny approach, no mediation took place. A Sobel test

further confirmed that there was no mediation as the z score ( $z=-1.212$ ) did not reach statistical significance.

### ***Household Income as the Mediator***

Table 5.4.4 reports the findings regarding the impact of household income as a mediator of the relationship between race and AFT cognitive test performance. In Equation 2, the findings once again show that the association between race and household income ( $b= -0.017$ ,  $p < 0.001$ ) is statistically significant, with racial minorities reporting significantly lower incomes than whites. Moving to Equation 3, household income significantly and positively influences AFT scores ( $b=0.715$ ,  $p < .001$ ) such that those with higher income levels report higher scores than those with lower incomes. Lastly, Equation 3 also reveals that introducing income as a mediating factor reduces the relationship between race and AFT scores ( $b= -0.153$ ,  $p < .001$ ). This reduction implies that approximately 7.3% of the effect of race on AFT scores is accounted for by household income, indicating partial mediation. Confirming this, the Sobel test ( $p < 0.001$ ,  $z= -9.775$ ), verifies the statistically significant mediating role of household income in the connection between race and AFT scores.

### ***Homeownership as the Mediator***

In exploring the influence of home ownership, Equation 2 in Table 5.4.4 sheds light on the connection between race and not owning a home ( $b= -0.004$ ,  $p < 0.001$ ), with racial minorities more often reporting non-homeownership compared to whites. Transitioning to Equation 3, we

**Table 5.4.4: Mediating Effect of Primary Stressors on the Relationship between Race and AFT Cognitive Test Scores**

Equations	B	SE	t	F	Sobel Test (z)
<b>Race → Education → AFT</b>	-0.165***	.008	-19.85	984.13 ***	-1.212
Equation 1 (X → Y = c) Race → AFT					
Equation 2 (X → M = a) Race → Education	-0.002	.001	-1.21	291.51 ***	
<b>Race → Income → AFT</b>	-0.165***	.008	-19.85	984.00 ***	-9.775***
Equation 1 (X → Y = c) Race → AFT					
Equation 2 (X → M = a) Race → Income	-0.017***	.001	-10.36	1078.35 ***	
Equation 3 (M → Y = b) Income → AFT	0.715***	.024	29.54	989.22 ***	
Equation 3 (X → M → Y = c') Race → Income → AFT	-0.153***	.008	-18.54		
<b>Race → Homeownership → AFT</b>	-0.165***	.008	-19.85	983.96 ***	-6.192***
Equation 1 (X → Y = c) Race → AFT					
Equation 2 (X → M = a) Race → Homeownership	-0.004***	.000	6.72	198.36 ***	
Equation 3 (M → Y = b) Homeownership → AFT	-1.098***	.068	-15.92	921.37 ***	
Equation 3 (X → M → Y = c') Race → Homeownership → AFT	-0.161***	.008	-19.43		

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

observe that non-homeownership is also linked to AFT scores (b= -0.415, p < 0.001): those who report not owning their homes tend to have lower AFT scores. Equation 3 also shows that incorporating homeownership as a factor results in a reduction in the association between race and AFT scores (b= -0.161, p < .001), and this reduction is statistically significant. Upon

adjusting for homeownership, the influence of race lessens by approximately 2.5%, indicating partial mediation. Confirming this, the Sobel test yields a p-value below 0.001 ( $z = -6.192$ ).

In summary, this section underscores the consistent exposure of racial minorities to higher levels of two of the three primary stressors (i.e., lower household income and non-homeownership but not lower levels of education) compared to whites. It also elucidates the detrimental impact of these stressors on performance across all four cognitive tests. Furthermore, it reveals that both lower household income and non-homeownership mediated the relationship between race and performance on all four cognitive tests. However, education did not act as a mediator in the relationship between race and performance on any of the cognitive tests. The subsequent subsection will delve into the relationship between race, secondary stressors, and cognitive test performance.

### **The Mediating Effect of Secondary Stressors on the Relationship between Race and Rey-I Cognitive Test Scores**

#### ***Self-Rated Health as the Mediator***

Table 5.4.5 reports the findings regarding the mediating effect of SRH on the connection between race and cognitive test performance. Equation 1 once again reveals a significant and negative link between race and Rey-I scores ( $b = -0.029$ ,  $p < .001$ ). Shifting to Equation 2, we note a statistically significant and negative correlation between race and SRH ( $b = -0.016$ ,  $p < 0.001$ ), revealing that racial minority group members reported lower SRH compared to whites. Equation 3 reveals a positive association between SRH and Rey-I scores ( $b = 0.219$ ,

$p < .001$ ), indicating that those with higher SRH also had higher Rey-I scores. Lastly, Equation 3 also indicates that when SRH is introduced into the equation, there is a reduction in the race-Rey-I relationship ( $b = -0.025$ ,  $p < .001$ ). The influence of race on Rey-I scores diminishes by approximately 11.8% after factoring in SRH, thereby pointing to partial mediation. The Sobel test is significant ( $p < 0.001$ ,  $z = -9.557$ ), further affirming the mediating role of SRH in the race-Rey-I association.

### ***Self-Rated Mental Health as the Mediator***

Table 5.4.5 illustrates the outcomes concerning the mediating influence of SRMH on the connection between race and Rey-I cognitive test performance. Equation 2 shows that race is negatively connected to SRMH ( $b = -.006$ ,  $p < 0.001$ ), with racial minorities reporting lower SRMH compared to whites. Advancing to Equation 3, SRMH demonstrates a significant association with Rey-I scores ( $b = 0.233$ ,  $p < .001$ ), with those reporting higher SRMH also obtaining higher Rey-I scores. Lastly, Equation 3 also shows that with the introduction of SRMH, the association between race and Rey-I scores undergoes a significant reduction ( $b = -0.028$ ,  $p < .001$ ). The impact of race on Rey-I scores decreases by approximately 4.9% when considering SRMH, again suggesting partial mediation. The Sobel test establishes  $p < 0.001$  ( $z = -4.299$ ), affirming the statistically significant mediating effect of SRMH on the relationship between race and Rey-I scores.

### ***Depression as the Mediator***

The findings in Table 5.4.5 elaborate on how depression mediates the connection between race and cognitive performance on the Rey-I. As previously noted, Equation 1 reveals a

significant relationship between race and Rey-I scores ( $b = -0.225, p < .001$ ). Equation 2 demonstrates that race is also linked to depression ( $b = 0.045, p < 0.001$ ), with racial minorities reporting more depressive symptoms compared to whites. Progressing to Equation 3, depression is negatively associated with Rey-I scores ( $b = -0.024, p < .001$ ), indicating that those with more depressive symptoms obtained lower Rey-I scores. Finally, in Equation 3 as well, introducing depression as a mediating variable results in a reduction in the relationship between race and Rey-I scores ( $b = -0.028, p < .001$ ). The impact of race is diminished by 3.8% after considering depression, again suggesting partial mediation. The Sobel test, with  $p < 0.001$  ( $z = -4.786$ ), verifies the statistically significant mediating role of depression on the relationship between race and Rey-I scores.

### ***Life Satisfaction as the Mediator***

Equations 1 and 2 affirm previously established relationships between race and Rey-I scores ( $b = -0.029, p < .001$ ) as well as between race and life satisfaction ( $b = -0.094, p < 0.001$ ). Transitioning to Equation 3, a connection is revealed between life satisfaction and cognitive performance on the Rey-I ( $b = 0.023, p < .001$ ), with those reporting higher life satisfaction obtaining higher Rey-I scores. Additionally, the introduction of life satisfaction results in a reduction in the relationship between race and Rey-I scores ( $b = -0.026, p < .001$ ), and this outcome maintains statistical significance. After adjusting for differences in life satisfaction, the impact of race on Rey-I scores diminishes by approximately 7.7%, indicating partial mediation. The Sobel test, reflecting a p-value below 0.001 ( $z = -8.246$ ), corroborates the statistically significant mediating influence of life satisfaction on the connection between race and Rey-I scores.

**Table 5.4.5: Mediating Effect of Secondary Stressors on the Relationship between Race and Rey-I Cognitive Test Scores**

Equations	B	SE	t	F	Sobel Test (z)
<b>Race → SRH → Rey-I</b>					
Equation 1 (X → Y = c) Race → Rey-I	-0.029***	0.003	-9.36	828.05 ***	-9.557***
Equation 2 (X → M = a) Race → SRH	-0.016***	0.001	10.58	198.13 ***	
Equation 3 (M → Y = b) SRH → Rey-I	.219***	0.009	-22.25	802.64 ***	
Equation 3 (X → M → Y = c') Race → SRH → Rey-I	-0.025***	0.003	-8.31		
<b>Race → SRMH → Rey -II</b>	-0.029***	0.003	-9.36	828.05 ***	
Equation 1 (X → Y = c) Race → Rey-I					
Equation 2 (X → M = a) Race → SRMH	-0.006***	0.001	-4.38	87.68 ***	
Equation 3 (M → Y = b) SRMH → Rey-I	0.233***	0.010	23.17	809.18 ***	
Equation 3 (X → M → Y = c') Race → SRMH → Rey-I	-0.028***	0.003	-8.95		
<b>Race → Depression → Rey-I</b>					
Equation 1 (X → Y = c) Race → Rey-I	-0.029***	0.003	-9.36	828.05 ***	-4.786***
Equation 2 (X → M = a) Race → Depression	0.045***	0.008	5.01	87.77 ***	
Equation 3 (M → Y = b) Depression → Rey-I	-0.024***	0.001	-16.06	780.96 ***	
Equation 3 (X → M → Y = c') Race → Depression → Rey-I	-0.028***	0.003	-9.02		
<b>Race → Life Satisfaction → Rey-I</b>	-0.029***	0.0031	-9.36	828.05 ***	
Equation 1 (X → Y = c) Race → Rey-I					
Equation 2 (X → M = a) Race → Life Satisfaction	-0.094***	0.010	-9.39	110.21 ***	
Equation 3 (M → Y = b) Life Satisfaction → Rey-I	0.023***	0.001	17.21	846.50 ***	
Equation 3 (X → M → Y = c') Race → Life Satisfaction → Rey-I	-0.026***	0.003	-8.65		

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

## **The Mediating Effect of Secondary Stressors on the Relationship between Race and Rey-II Cognitive Test Scores**

### ***Self-Rated Health as the Mediator***

The results of analyses investigating the mediating effect of SRH on the relationship between race and performance on the Rey-II cognitive test are outlined in Table 5.4.6. In Equation 1, it is evident that race is significantly and negatively associated with Rey-II scores ( $b = -0.031, p < .001$ ). Transitioning to Equation 2, we once again observe a statistically significant relationship between race and SRH ( $b = -0.016, p < 0.001$ ). Progressing to Equation 3, SRH demonstrates a significant association with performance on the Rey-II ( $b = 0.214, p < .001$ ), with those reporting higher SRH obtaining higher Rey-II scores. With the introduction of SRH, the relationship between race and Rey-II experiences a significant reduction ( $b = -0.027, p < .001$ ). The impact of race on Rey-II scores is lessened by approximately 10.8% after accounting for SRH, indicating partial mediation. The Sobel test yielded  $p < 0.001$  ( $z = -9.379$ ), confirming the statistically significant mediating effect of SRH on the relationship between race and Rey-II scores.

### ***Self-Rated Mental Health as the Mediator***

The findings regarding the mediating function of SRMH on the relationship between race and cognitive test performance on the Rey-II are also presented in Table 5.4.6. Equation 2 reveals that race is significantly and negatively associated with SRMH ( $b = -0.006, p < 0.001$ ). Advancing to Equation 3, SRMH demonstrates a positive association with Rey-II scores ( $b = 0.236, p < 0.001$ ), indicating that with those reporting higher SRMH obtaining higher Rey-II scores. Finally, with the introduction of SRMH into the equation, the relationship between race

**Table 5.4.6: Mediating Effect of Secondary Stressors on the Relationship between Race and Rey-II Cognitive Test Scores**

Equations	B	SE	t	F	Sobel Test (z)
<b>Race → SRH → Rey-II</b>	-.031***	.003	-8.89	850.53 ***	-9.379***
Equation 1 (X → Y = c) Race → Rey-II					
Equation 2 (X → M = a) Race → SRH					
Equation 3 (M → Y = b) SRH → Rey-II					
Equation 3 (X → M → Y = c')					
<b>Race → SRMH → Rey-II</b>	-.031***	.003	-8.89	850.53 ***	-4.282***
Equation 1 (X → Y = c) Race → Rey-II					
Equation 2 (X → M = a) Race → SRMH					
Equation 3 (M → Y = b) SRMH → Rey-II					
Equation 3 (X → M → Y = c')					
<b>Race → Depression → Rey-II</b>	-.031***	.003	-8.89	850.53 ***	-4.746***
Equation 1 (X → Y = c) Race → Rey-II					
Equation 2 (X → M = a) Race → Depression					
Equation 3 (M → Y = b) Depression → Rey-II					
Equation 3 (X → M → Y = c')					
<b>Race → Life Satisfaction → Rey-II</b>	-.031***	.003	-8.89	850.53 ***	-7.984***
Equation 1 (X → Y = c) Race → Rey-II					
Equation 2 (X → M = a) Race → Life Satisfaction					
Equation 3 (M → Y = b) Life Satisfaction → Rey-II					
Equation 3 (X → M → Y = c')					

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

and Rey-II scores experiences a reduction ( $b = -0.029$ ,  $p < .001$ ). Consequently, the impact of race on Rey-II test scores is lessened by approximately 4.6% when considering SRMH, again indicating partial mediation. The Sobel test reveals  $p < 0.001$  ( $z = -4.282$ ), validating the statistically significant mediating effect of SRMH on the relationship between race and Rey-II scores.

### ***Depression as the Mediator***

Race is associated with depression ( $b = 0.045$ ,  $p < 0.001$ ), such that racial minorities report greater depressive symptomatology than whites. Depression also shows an association with Rey-II scores ( $b = -0.025$ ,  $p < .001$ ), with those reporting more depressive symptoms obtaining lower Rey-II scores. Finally, introducing depression as a mediator leads to a reduction in the relationship between race and Rey-II scores ( $b = -0.030$ ,  $p < .001$ ). The influence of race is reduced by approximately 3.7% when considering household depression, indicating partial mediation. The Sobel test, yielding  $p < 0.001$  ( $z = -4.746$ ), validates the statistically significant mediating role of household depression in the relationship between race and Rey-II scores.

### ***Life Satisfaction as the Mediator***

The findings reveal a significant negative relationship between race and life satisfaction ( $b = -0.094$ ,  $p < 0.001$ ): thus racial minority group members report lower life satisfaction than whites. As well, a positive connection is established between life satisfaction and Rey-II scores ( $b = 0.023$ ,  $p < .001$ ), indicating that those reporting higher life satisfaction were likely to obtain higher Rey-II scores. Furthermore, the introduction of life satisfaction leads to a significant reduction in the correlation between race and Rey-II scores ( $b = -0.028$ ,  $p < .001$ ). When Rey-II test performance is adjusted for life satisfaction, the impact of race diminishes by around 7.2%,

indicating partial mediation. The statistically significant mediating influence of life satisfaction on the relationship between race and Rey-II is also confirmed by the Sobel test, with a p-value under 0.001 ( $z = -7.984$ ).

### **The Mediating Effect of Secondary Stressors on the Relationship between Race and MAT Cognitive Test Scores**

#### ***Self-Rated Health as the Mediator***

The results of analyses investigating the mediating effect of SRH on the relationship between race and performance on the MAT cognitive test are outlined in Table 5.4.7. The findings once again reveal a statistically significant correlation between race and SRH ( $b = -0.016$ ,  $p < 0.001$ ), with those in racial minority group members experiencing lower SRH compared to whites. In Equation 3, SRH demonstrates a positive association with performance on the MAT ( $b = 1.171$ ,  $p < .001$ ), indicating that those with better SRH were likely to obtain higher MAT scores. With the introduction of SRH, the relationship between race and MAT scores experiences a reduction ( $b = -0.205$ ,  $p < .001$ ). The impact of race on MAT scores is lessened by approximately 8.1% after accounting for household income, thereby indicating partial mediation. The Sobel test yielded  $p < 0.001$  ( $z = -9.868$ ), confirming the statistically significant mediating effect of household income on the relationship between race and MAT scores.

#### ***Self-Rated Mental Health as the Mediator***

The findings regarding the mediating function of SRMH in the relationship between race and cognitive test performance on the MAT are presented in Table 5.4.7. Equation 2 once again

indicates that race is significantly associated with SRMH ( $b = -0.006$ ,  $p < 0.001$ ), with racial minorities reporting lower SRMH compared to whites. Advancing to Equation 3, SRMH demonstrates a positive association with MAT test performance ( $b = 1.278$ ,  $p < 0.001$ ), indicating that those reporting higher SRMH tended to obtain higher MAT scores. Finally, with the introduction of SRMH into the equation, the relationship between race and MAT scores experiences a reduction ( $b = -0.216$ ,  $p < .001$ ). The impact of race on MAT scores is lessened by approximately 3.4% when considering SRMH, indicating partial mediation. The Sobel test reveals  $p < 0.001$  ( $z = -4.320$ ), validating the statistically significant mediating effect of SRMH on the relationship between race and MAT scores.

### ***Depression as the Mediator***

Beginning with Equation 2, we observe that race is positively correlated with depression ( $b = 0.045$ ,  $p < 0.001$ ). Advancing to Equation 3, depression shows a negative association with MAT scores ( $b = -0.115$ ,  $p < .001$ ), indicating that those with more depressive symptoms tend to obtain lower MAT scores. Finally, introducing depression as a mediating variable leads to a reduction in the relationship between race and MAT scores ( $b = -0.218$ ,  $p < .001$ ). The influence of race is reduced by approximately 2.3% when considering depression, indicating partial mediation. The Sobel test, yielding  $p < 0.001$  ( $z = -4.806$ ), validates the statistically significant mediating role of depression in the relationship between race and MAT scores.

### ***Life Satisfaction as the Mediator***

In Equation 2, the relationship between race and life satisfaction ( $b = -0.094$ ,  $p < 0.001$ ) is

**Table 5.4.7: Mediating Effect of Secondary Stressors on the Relationship between Race and MAT Cognitive Test Scores**

Equations	B	SE	t	F	Sobel Test (z)
<b>Race → SRH → MAT</b>					
Equation 1 (X → Y = c) Race → MAT	-.223***	.014	-15.77	478.00 ***	-9.868***
Equation 2 (X → M = a) Race → SRH	-.016***	.001	10.57	198.11 ***	
Equation 3 (M → Y = b) SRH → MAT	1.171***	.042	-27.53	511.01 ***	
Equation 3 (X → M → Y = c')	-.205***	.014	-14.57		
<b>Race → SRMH → MAT</b>					
Equation 1 (X → Y = c) Race → MAT	-.223***	.014	-15.77	478.00 ***	-4.320 ***
Equation 2 (X → M = a) Race → SRMH	-.006***	.001	-4.37	87.67 ***	
Equation 3 (M → Y = b) SRMH → MAT	1.278***	.045	28.26	514.81 ***	
Equation 3 (X → M → Y = c')	-.216***	.014	-15.34		
<b>Race → Depression → MAT</b>					
Equation 1 (X → Y = c) Race → MAT	-.223***	.014	-15.77	478.00 ***	-4.806 ***
Equation 2 (X → M = a) Race → Depression	.045***	.009	5.02	82.25 ***	
Equation 3 (M → Y = b) Depression → MAT	-.115***	.007	-16.81	462.48 ***	
Equation 4 (X → M → Y = c')	-.218***	.014	-15.44		
<b>Race → Life Satisfaction → MAT</b>					
Equation 1 (X → Y = c) Race → MAT	-.223***	.014	-15.77	478.00 ***	-8.437 ***
Equation 2 (X → M = a) Race → Life Satisfaction	-.094***	.010	-9.39	99.72 ***	
Equation 3 (M → Y = b) Life Satisfaction → MAT	.118***	.006	19.19	471.49 ***	
Equation 4 (X → M → Y = c')	-.212***	.014	-15.05		

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

negative in direction, indicating that racial minority group members experienced lower life satisfaction when compared to whites. In Equation 3, a connection is established between life satisfaction and MAT scores ( $b=0.118$ ,  $p < .001$ ), indicating that those with lower life satisfaction obtained lower MAT scores compared to those with higher life satisfaction. Furthermore, the introduction of life satisfaction leads to a reduction in the correlation between race and MAT scores ( $b= -0.212$ ,  $p < .001$ ), and this decrease is statistically significant. When MAT scores are adjusted for life satisfaction, the impact of race diminishes by around 5%, indicating partial mediation. The statistically significant mediating influence of life satisfaction on the relationship between race and MAT is confirmed by the Sobel test, with a p-value under 0.001 ( $z= -8.437$ ).

### **The Mediating Effect of Secondary Stressors on the Relationship between Race and AFT Cognitive Test Scores**

#### ***Self-Rated Health as the Mediator***

The results of analyses investigating the mediating effect of SRH on the relationship between race and performance on the AFT cognitive test are outlined in Table 5.4.8. In Equation 2, we observe a statistically significant and negative correlation between race and SRH ( $b= -0.015$ ,  $p < 0.001$ ), indicating that racial minority group members were more likely to report lower SRH compared to whites. In Equation 3, SRH demonstrates a positive association with performance on the AFT ( $b=.625$ ,  $p < .001$ ), with those with higher SRH obtaining higher AFT scores compared to those with lower SRH. With the introduction of SRH, the relationship between race and AFT test performance experiences a reduction ( $b= -0.155$ ,  $p < .001$ ). The

impact of race on AFT scores is lessened by approximately 5.9% after accounting for SRH, indicating partial mediation. The Sobel test yielded  $p < 0.001$  ( $z = -9.738$ ), confirming the statistically significant mediating effect of SRH on the relationship between race and AFT scores.

### ***Self-Rated Mental Health as the Mediator***

The findings regarding the mediating function of SRMH on the relationship between race and cognitive test performance on the AFT are presented in Table 5.4.8. Equation 2 once again indicates that race is significantly and negatively associated with SRMH ( $b = -0.006$ ,  $p < 0.001$ ). Advancing to Equation 3, SRMH demonstrates a significant and positive association with AFT scores ( $b = 0.585$ ,  $p < 0.001$ ). Finally, with the introduction of SRMH into the equation, the relationship between race and AFT scores experiences a reduction ( $b = -0.161$ ,  $p < .001$ ). The impact of race on AFT is lessened by approximately 3.4% when considering SRMH, indicating partial mediation. The Sobel test reveals  $p < 0.001$  ( $z = -4.286$ ), validating the statistically significant mediating effect of SRMH on the relationship between race and AFT scores.

### ***Depression as the Mediator***

Racial minority status is positively correlated with depression ( $b = 0.045$ ,  $p < 0.001$ ), indicating that racial minority group members reported higher levels of depressive symptoms compared to whites. Depression shows a negative association with AFT scores ( $b = -0.062$ ,  $p < .001$ ), indicating that with those with more depressive symptoms tend to have lower AFT

**Table 5.4.8: The Mediating Effect of Secondary Stressors on the relationship between Race and AFT Cognitive Test Scores**

Equations	B	SE	t	F	Sobel Test (z)
<b>Race → SPH → AFT</b>					
Equation 1 (X → Y = c) Race → AFT	-.165***	.008	-19.89	986.45 ***	-9.738***
Equation 2 (X → M = a) Race → SRH	-.015***	.001	10.57	198.11 ***	
Equation 3 (M → Y = b) SRH → AFT	.625***	.025	-25.04	964.64 ***	
Equation 3 (X → M → Y = c') Race → SRH → AFT	-.155***	.008	-18.83		
<b>Race → SRMH → AFT</b>					
Equation 1 (X → Y = c) Race → AFT	-.165***	.008	-19.89	986.45 ***	-4.286***
Equation 2 (X → M = a) Race → SRMH	-.006***	.001	-4.37	87.67 ***	
Equation 3 (M → Y = b) SRMH → AFT	.585***	.027	21.82	947.91 ***	
Equation 3 (X → M → Y = c') Race → SRMH → AFT	-.161***	.008	-19.56		
<b>Race → Depression → AFT</b>					
Equation 1 (X → Y = c) Race → AFT	-.165***	.008	-19.89	986.45 ***	-4.752***
Equation 2 (X → M = a) Race → Depression	.045***	.009	5.02	82.25 ***	
Equation 3 (M → Y = b) Depression → AFT	-.062***	.004	-14.86	917.18 ***	
Equation 3 (X → M → Y = c') Race → Depression → AFT	-.162***	.008	-19.59		
<b>Race → Life Satisfaction → AFT</b>					
Equation 1 (X → Y = c) Race → AFT	-.165***	.008	-19.89	986.45 ***	-7.910***
Equation 2 (X → M = a) Race → Life Satisfaction	-.094***	.010	-9.39	99.72 ***	
Equation 3 (M → Y = b) Life Satisfaction → AFT	.055***	.004	14.66	918.30 ***	
Equation 3 (X → M → Y = c') Race → Life Satisfaction → AFT	-.160***	.008	-19.31		

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

scores compared to those with fewer depressive symptoms. Finally, introducing depression into the equation leads to a reduction in the relationship between race and AFT scores ( $b = -0.162$ ,  $p < .001$ ). The influence of race is reduced by approximately 1.7% when considering household depression, indicating partial mediation. The Sobel test, yielding  $p < 0.001$  ( $z = -4.752$ ), validates the statistically significant mediating role of household depression in the relationship between race and AFT.

### ***Life Satisfaction as the Mediator***

Equation 2 once again reveals a negative relationship between race and life satisfaction ( $b = -0.094$ ,  $p < 0.001$ ). Moving on to Equation 3, a connection is established between life satisfaction and AFT scores ( $b = 0.055$ ,  $p < .001$ ), with those reporting higher life satisfaction obtaining higher Aft scores compared to those reporting lower life satisfaction. Furthermore, the introduction of life satisfaction leads to a significant reduction in the relationship between race and AFT scores ( $b = -0.160$ ,  $p < .001$ ). When AFT scores are adjusted for life satisfaction, the impact of race diminishes by around 3.1%, indicating partial mediation. The statistically significant mediating influence of life satisfaction on the relationship between race and AFT is confirmed by the Sobel test, with a p-value under 0.001 ( $z = -7.910$ )

In summary, the findings in this subsection underscore the consistent exposure of racial minorities to higher levels of most of the primary and secondary stressors studied (with the exception of education as a primary stressor) compared to whites. They also confirm the detrimental impact of exposure to most of these stressors on performance across most cognitive tests. Overall, the results partially support hypothesis three, indicating that associations between

racial minority status and cognitive functioning are in part mediated by differences in exposure to most of the primary and secondary stressors studied.

#### **5.5 Hypothesis 4: Associations between race, stressors (primary and secondary) and cognitive functioning will be moderated by the level of social resources available.**

Ordinary least squares regression equations were used to explore the moderating effect of social resources (including marital status, social network size, frequency of contacts, social support, and participation in social activities) on the relationships between exposure to various stressors and cognitive test performance. The moderation effect was assessed by examining the significance of the three-way interaction involving race, stress-related exposure, and social resources. The initial model included only race and the control variables, while the second model incorporated race, exposure to a specific stressor, and a specific measure of social resources. The final model further incorporated both the two-way interactions (between race and a given stressor, race and social resources, stressor and social resources) and the three-way interaction among race, a specific stressor, and social resources. Additionally, all models were adjusted for gender, immigrant status, age, religion, residence, language, chronic illness, and study cohort.

#### **The Moderating Effect of Social Resources on Relationships between Race, Primary Stressors and Cognitive Test Performance**

### *Race, Education and Marital Status*

Table 5.5.1 outlines the results of OLS regressions for cognitive tests involving race, education, and marital status. In Model 5.1, the effect of the social location and control variables on Rey-I scores was examined, revealing statistically significant results for almost all variables (gender, age, immigrant status, language, residence, religion, and cohort but not chronic illness). In Model 5.2, both education and marital status demonstrated a significant impact on Rey-I scores. Those with higher education levels were likely to obtain higher scores compared to those with lower education levels while those who were not currently married were likely to obtain lower scores compared to those who were married/cohabiting. The introduction of the three-way interaction term (race x education x marital status) in Model 5.3 did not show a statistically significant effect on Rey-I scores. The results were similar in analyses of the Rey-II.

Likewise, in Table 5.5.2, with MAT scores as an outcome in Model 5.8, education and marital status demonstrated significance. Again, those with higher education were likely to obtain higher scores compared to those with lower education and those who were currently married/not currently married were likely to obtain lower scores compared to those who were married/cohabiting. The subsequent introduction of the three-way interaction term in Model 5.9 did not achieve statistical significance.

Once again, the same pattern of results was evident for AFT scores. Those with higher education obtained higher scores compared to those with lower education whereas those who were unmarried obtained lower scores compared to those who were married/cohabiting. However, the interaction term in Model 5.12 was not statistically significant. In conclusion,

**Table 5.5.1: Interaction Effect of Race, Education and Marital Status on Rey-I and Rey-II Cognitive Test Scores**

Variables	Rey-I			Rey-II		
	Model 5.1	Model 5.2	Model 5.3	Model 5.4	Model 5.5	Model 5.6
Race (Minority=1)	-.410***	-.402***	-.530*	-.437***	-.432***	-.661*
Gender (Female=1)	.937***	.985***	.985	1.108***	1.153***	1.153***
Immigrant Status (Immigrant=1)	.037***	.016	.015	.043***	.022***	.021*
Age	-.058***	-.052***	-.052	-.065***	-.059***	-.059***
Religious Affiliation (Non-religious=1)	.189***	.166***	.166	.217***	.192***	.192***
Residence (Urban=1)	.005***	.003***	.003	.008*	.006*	.006*
Language (Non-English=1)	-.192***	-.168***	-.169	-.056***	-.033***	-.034***
Chronic Illness (Yes=1)	-.119	-.101***	-.101	-.135***	-.118***	-.117***
Cohort (Comprehensive=1)	-.410***	-.068***	-.068	-.165***	-.192***	-.193***
Education		.294***	.308***		.300***	.313***
Marital Status		-.188***	-.051		-.161***	-.016
Race X Education			.039			.076
Race X Marital Status			.086			-.032
Education X Marital Status			-.039*			-.040
Race X Education X Marital Status			-.037			-.034
Intercept	9.212***	7.883***	7.836***	7.914***	6.567***	6.523***
R <sup>2</sup>	.143	.162	.162	.147	.163	.163
△ R <sup>2</sup>	.143	.019	.000	.147	.016	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.  
 \*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.2: Interaction Effect of Race, Education and Marital Status on MAT and AFT Cognitive Test Scores**

Variables	MAT			AFT		
	Model 5.7	Model 5.8	Model 5.9	Model 5.10	Model 5.11	Model 5.12
Race (Minority=1)	-3.298***	-3.269***	-2.842***	-2.476	-2.370***	-.649
Gender (Female=1)	-1.117***	-.855***	-.856***	-.219***	-.173***	-.115**
Immigrant Status (Immigrant=1)	-.073***	-.182***	-.180***	.005	-.045***	-.049**
Age	-.227***	-.196***	-.196***	-.193***	-.178***	-.177***
Religious Affiliation (Non-religious=1)	1.375***	1.256***	1.256***	1.318***	1.252***	1.237***
Residence (Urban=1)	.069***	.057***	.057***	-.003	-.011	-.012
Language (Non-English=1)	-.741***	-.615***	-.613***	-.956***	-.891***	-.891***
Chronic Illness (Yes=1)	-.490***	-.401***	-.406***	-.159	-.074	-.119
Cohort (Comprehensive=1)	.279***	.143***	.145***	.114***	.047	.034
Education		1.510***	1.432***		.866***	.898***
Marital Status (not currently married=1)		-1.021***	-1.801***		.020***	-.384*
Race X Education			-.123			-.499**
Race X Marital Status			.086			.155
Education X Marital Status			.226**			.011
Race X Education X Marital Status			-.005			-.054
Intercept	40.876***	34.045***	34.318***	32.180***	28.278***	28.223***
R <sup>2</sup>	.090	.117	.117	.163	.184	.184
Δ R <sup>2</sup>	.143	.027	.000	.163	.021	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

marital status did not have a moderating effect on the relationship between race, education and cognitive test performance regardless of the measure used.

### ***Race, Education and Network Size***

Table 5.5.3 displays the outcomes of OLS regressions addressing the impact of race, education, and network size on each of the four cognitive tests. In Model 5.14, both education and network size were found to exhibit a significant impact on Rey-I scores. Both higher education levels and larger social networks were associated with higher Rey-I scores. However, introducing the three-way interaction term (race x education x network size) in Model 5.15 did not show a statistically significant effect on Rey-I test performance. Similar results emerged for the Rey-II.

Similarly, with MAT scores as the dependent variable in Model 5.20, education and network size demonstrated significance. Again, individuals with higher education achieved higher scores compared to those with lower education. Network size was positively associated with MAT scores such that those who had larger social networks obtained higher scores compared to those with smaller social networks. However, the subsequent introduction of the three-way interaction term in Model 5.21 was not statistically significant. Models 5.22 to 5.24 report the results obtained when AFT scores served as the outcome variable. Again, the interaction term in Model 5.24 was not statistically significant. In conclusion, according to these findings, network size did not have a moderating effect on the relationship between race, education and cognitive test performance.

**Table 5.5.3: Interaction Effect of Race, Education and Network Size on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.13	Model 5.14	Model 5.15	Model 5.16	Model 5.17	Model 5.18
Race	-.410***	-.414***	-.132	-.437***	-.443***	-.407
Education		.299***	.314***		.305***	.331***
Network Size		.001***	.002		.001*	.003*
Race X Education			-.070			.000
Race X Network Size			-.008			-.005
Education X Network Size			-.000			-.001
Race X Education X Network Size			.002			.002
Intercept	9.212***	7.873***	7.820***	7.914***	6.551***	6.461***
R <sup>2</sup>	.143	.161	.161	.147	.162	.162
△ R <sup>2</sup>	.143	.018	.000	.147	.015	.000
	MAT			AFT		
	Model 5.19	Model 5.20	Model 5.21	Model 5.22	Model 5.23	Model 5.24
Race	-3.298***	-3.317***	-2.680	-2.476***	-2.506***	-1.571
Education		1.532***	1.472***		.893***	1.012***
Network Size		.003*	-.002		.004***	.011***
Race X Education			-.118			-.176
Race X Network Size			-.003			.017
Education X Network Size			.001			-.002**
Race X Education X Network Size			-.000			-.006
Intercept	40.876***	34.119***	34.308***	32.180***	28.087***	27.661***
R <sup>2</sup>	.090	.114	.114	.163	.183	.184
△ R <sup>2</sup>	.090	.014	.000	.163	.020	.001

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

### ***Race, Education and Frequency of Contact***

Table 5.5.4 illustrates the results of OLS regressions involving race, education, and frequency of contact as predictors of performance on each of the four cognitive tests. Model 5.26 indicates that both education and frequency of contact significantly influenced Rey-I scores. Individuals with higher education achieved higher scores compared to those with lower education. Frequency of contact also showed a positive correlation with Rey-I scores, indicating that individuals with more frequent contact with others in their social networks achieved higher scores compared to those with less frequent contact. However, the introduction of the three-way interaction term (race x education x frequency of contact) in Model 5.27 did not demonstrate a statistically significant effect on Rey-I scores and did not enhance the explanatory power of the model. The results were similar for each of the other three measures. Overall, these results indicate that frequency of contact did not appear to have a moderating effect on the relationship between race, education and cognitive test performance.

### ***Race, Education and Social Support***

Table 5.5.5 presents the results of the OLS regressions of the cognitive tests on race, education, and social support. Education and social support were introduced in Model 5.38, both of which demonstrated statistically significant effects on Rey-I scores. Individuals with higher education levels performed better on the Rey-I compared to those with lower education. Social support was also positively associated with Rey-I scores such that those who received greater social support also obtained higher scores compared to those with lower levels of social support. Finally, the three-way interaction term involving race, education and social support (i.e., race x

education x social support) was added in Model 5.39, but did not have a statistically significant effect on Rey-I test performance. The results were similar for each of the other three measures.

**Table 5.5.4: Interaction Effect of Race, Education and Frequency of Contact on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.25	Model 5.26	Model 5.27	Model 5.28	Model 5.29	Model 5.30
Race	-.410***	-.400***	-.570	-.437***	-.430***	-.577
Education		.298***	.316**		.304***	.349***
Frequency of Contact		.014***	.018		.011***	.019
Race X Education			.043			.241
Race X Frequency of Contact			.003			.042
Education X Frequency of Contact			-.001			-.003
Race X Education X Frequency of Contact			-.001			-.009
Intercept	9.212***	7.658***	7.596***	7.914***	6.398***	6.252***
R <sup>2</sup>	.143	.161	.161	.147	.162	.162
△ R <sup>2</sup>	.143	.161	.000	.147	.013	.000
	MAT			AFT		
	Model 5.31	Model 5.32	Model 5.33	Model 5.34	Model 5.35	Model 5.36
Race	-3.298***	-3.243***	-4.226	-2.476***	-2.446***	-1.416
Education		1.532***	1.681***		.891***	.805***
Frequency of Contact		.109***	.132**		.052***	.023
Race X Education			-.146			-1.152
Race X Frequency of Contact			.080			-.006
Education X Frequency of Contact			-.008			.006
Race X Education X Frequency of Contact			.003			.040
Intercept	40.876***	32.179***	31.763***	32.180***	27.351***	27.797***
R <sup>2</sup>	.090	.115	.116	.163	.183	.184
△ R <sup>2</sup>	.090	.015	.001	.163	.020	.001

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.5: Interaction Effect of Race, Education and Social Support on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.37	Model 5.38	Model 5.39	Model 5.40	Model 5.41	Model 5.42
Race	-.410***	-.363***	-.200	-.437***	-.392***	-.543
Education		.288***	.282***		.293***	.253***
Social Support		.009***	.009***		.009***	.007***
Race X Education			-.051			-.008
Race X Social Support			-.004			-.002
Education X Social Support			.000			.000
Race X Education X Social Support			.001			.001
Intercept	9.212***	7.126***	7.145***	7.914***	5.808***	5.955***
R <sup>2</sup>	.143	.166	.166	.147	.167	.167
△ R <sup>2</sup>	.143	.023	.000	.147	.020	.000
	MAT			AFT		
	Model 5.43	Model 5.44	Model 5.45	Model 5.46	Model 5.47	Model 5.48
Race	-3.298***	-3.112***	-1.985***	-2.476***	-2.460***	-.649
Education		1.487***	1.914***		.866***	.694***
Social Support		.037***	.055***		.020***	.011**
Race X Education			-.501			-1.112*
Race X Social Support			-.009			-.009
Education X Social Support			-.005*			.002
Race X Education X Social Support			.005			.008
Intercept	40.876***	31.006***	29.614***	32.180***	26.543***	27.214***
R <sup>2</sup>	.090	.119	.119	.163	.187	.187
△ R <sup>2</sup>	.090	.019	.000	.163	.024	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

Overall, therefore, it can be concluded that social support did not have a moderating effect on the relationship between race, education and cognitive functioning.

### ***Race, Education and Social Participation***

Table 5.5.6 displays the outcomes of OLS regressions obtained when each of the four cognitive tests were regressed on race, education, and social participation. In Model 5.50, both education and social participation exhibited a positive association with Rey-I scores, indicating that individuals who participated in more social activities achieved higher scores compared to those who participated in fewer social activities. Introducing the three-way interaction term (race x education x social participation) in Model 5.51 also showed a statistically significant effect on Rey-I scores ( $B=.134, p<.03$ ).

Figure 5.5.1 shows that the positive impact of education on cognitive scores is most pronounced (i.e., the slope is steepest) among racial minorities with high levels of social participation. Additionally, the boost in educational benefits on Rey-I scores is more substantial when transitioning from low to high social participation, particularly among racial minorities compared to whites. Therefore, social participation enhances the beneficial effects of education more significantly for racial minorities than for whites. This suggests that social participation can help reduce racial disparities in cognitive functioning as education levels increase.

The results for the other three cognitive tests (i.e., the Rey-II, MAT and AFT) were similar to those obtained for the Rey-I with regard to the impact of education and social participation (see Models 5.53, 5.56, and 5.59). In each case, individuals with higher education achieved higher scores compared to those with lower education. Social participation also showed

**Table 5.5.6: Interaction Effect of Race, Education and Social Participation on Cognitive Test Scores**

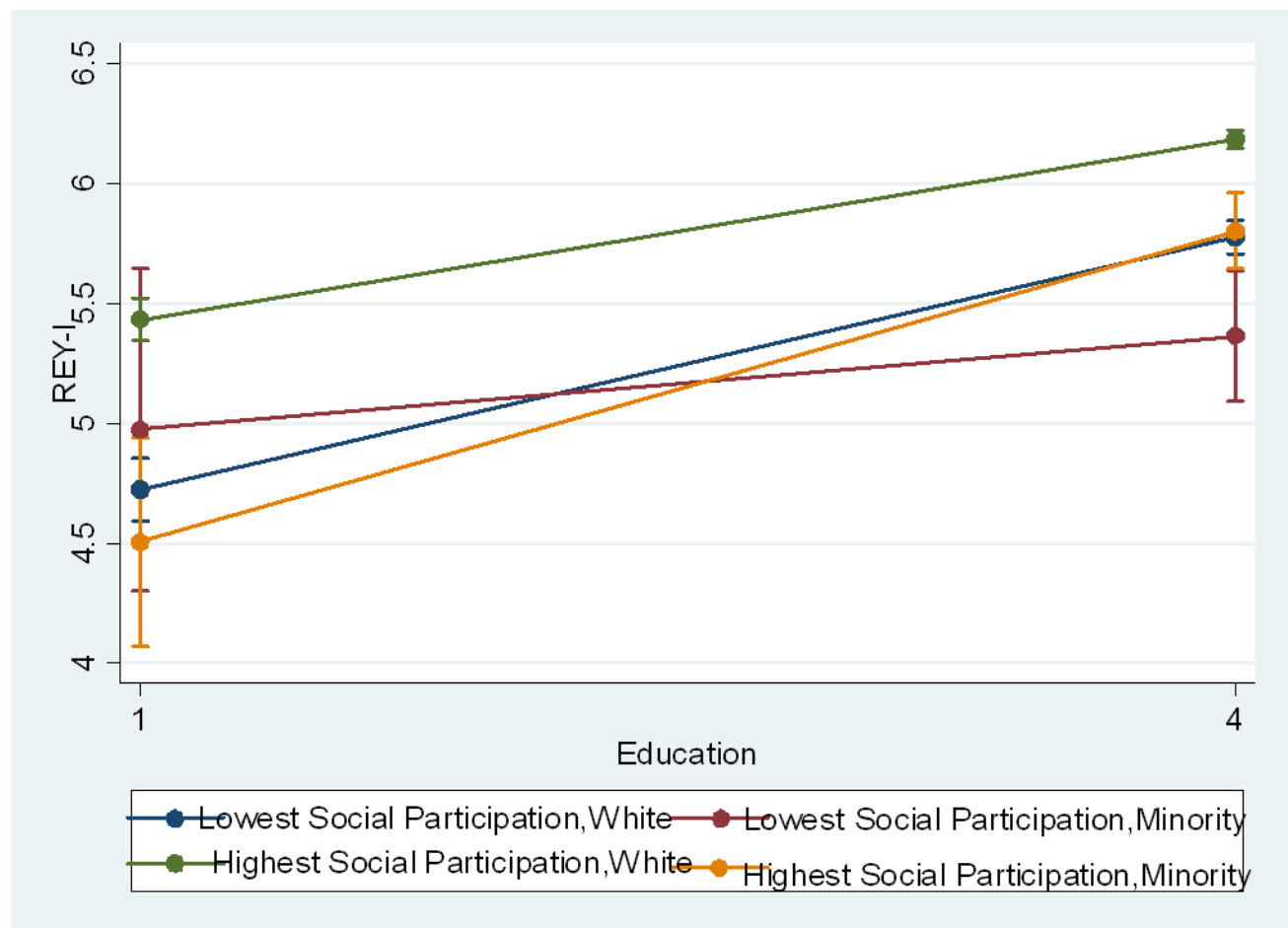
	Rey-I			Rey-II		
	Model 5.49	Model 5.50	Model 5.51	Model 5.52	Model 5.53	Model 5.54
Race	-.410***	-.405***	.996	-.437***	-.434***	1.028
Education		.288***	.383***		.294***	.329***
Social Participation		.156***	.269***		.143***	.193***
Race X Education			-.353			-.312
Race X Social Participation			-.526*			-.598*
Education X Social Participation			-.033**			-.013
Race X Education X Social Participation			.134*			.135
Intercept	9.212***	7.535***	7.214***	7.914***	6.249***	6.114***
R <sup>2</sup>	.143	.163	.163	.147	.163	.163
△ R <sup>2</sup>	.143	.020	.000	.147	.016	.000
	MAT			AFT		
	Model 5.54	Model 5.56	Model 5.57	Model 5.58	Model 5.59	Model 5.60
Race	-3.298***	-3.287***	1.700***	-2.476***	-2.466***	2.718
Education		1.494***	2.090***		.868***	.958***
Social Participation		.550***	1.236***		.333***	.419***
Race X Education			-1.338			-1.327*
Race X Social Participation			-1.588			-1.156
Education X Social Participation			-.204**			-.024
Race X Education X Social Participation			.424			.283
Intercept	40.876***	32.926***	30.946***	32.180***	27.523***	27.207***
R <sup>2</sup>	.090	.116	.116	.163	.184	.185
△ R <sup>2</sup>	.090	.016	.000	.163	.021	.001

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.  
\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

a positive association with cognitive test scores, indicating that individuals who participated in more social activities achieved higher scores compared to those who participated less in social activities. However, for each outcome, the three-way interaction term was not significant (see Models 5.54, 5.57 and 5.60). In conclusion, social participation was found to have had a moderating effect on the relationship between race, education and Rey-I cognitive test scores but not the other cognitive tests.

**Figure 5.5.1: Interaction Effect of Race, Education and Social Participation on Rey-I Scores**



**Table 5.5.7: Interaction Effect of Race, Household Income and Marital Status on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.61	Model 5.62	Model 5.63	Model 5.64	Model 5.65	Model 5.66
Race	-.410***	-.348****	-.382**	-.437***	-.379***	-.546***
Household Income		.241***	.218***		.229***	.193***
Marital Status		-.001	-.218**		.038	-.253***
Race X Household Income			.012			.063
Race X Marital Status			-.095			-.149
Household Income X Marital Status			.081***			.112**
Race X Household Income X Marital Status			.033			.026
Intercept	9.212***	7.831***	7.526***	7.914***	6.595***	6.731***
R <sup>2</sup>	.143	.158	.159	.148	.158	.159
△ R <sup>2</sup>	.143	.015	.001	.148	.010	.001
	MAT			AFT		
	Model 5.67	Model 5.68	Model 5.69	Model 5.70	Model 5.71	Model 5.72
Race	-3.298***	-2.878***	-4.034***	-2.476***	-2.275***	-2.770***
Household Income		1.377***	1.223***		.758***	.692***
Marital Status		.071***	-1.231***		.244**	-.316
Race X Household Income			.317			.148
Race X Marital Status			.462			.437
Household Income X Marital Status			.478***			.209***
Race X Household Income X Marital Status			.075			-.126
Intercept	40.876***	33.004***	33.603***	32.180***	27.948***	28.201***
R <sup>2</sup>	.090	.111	.112	.163	.178	.178
△ R <sup>2</sup>	.090	.011	.001	.163	.015	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

### ***Race, Household Income and Marital Status***

Table 5.5.7 presents the results of OLS regressions investigating associations between race, household income, and marital status and cognitive test outcomes. In addition to race, household income was found to be significantly and positively related to Rey-I scores (Model 5.62). The introduction of the three-way interaction term (race x household income x marital status) in Model 5.63 did not reveal a statistically significant association with Rey-I scores. Similar results were obtained when the Rey-II, the MAT and the AFT served as dependent variables. Thus, in summary, the interactions among race, household income, and marital status did not emerge as statistically significant correlates of cognitive test performance.

### ***Race, Household Income and Network Size***

Table 5.5.8 presents the findings from regressions of each of the four cognitive tests on race, household income, and network size. In Model 5.74, household income was significantly associated with Rey-I scores, but network size was not. Those with higher household incomes attained higher Rey-I scores compared to those with lower incomes. However, the inclusion of the three-way interaction term (race x household income x network size) in Model 5.75 did not yield a statistically significant effect on Rey-I scores and did not enhance explanatory power. Moving to the Rey-II, the results were similar. Model 5.77, featuring household income, displayed statistically significant outcomes, but network size was not statistically significant. As well, the three-way interaction term in Model 5.78 was not significant and did not contribute to the explanatory value of the model.

**Table 5.5.8: Interaction Effect of Race, Household Income and Network Size on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.73	Model 5.74	Model 5.75	Model 5.76	Model 5.77	Model 5.78
Race	-.410***	-.353***	-.347	-.437***	-.384***	-.535**
Household Income		.242***	.248***		.222***	.231***
Network size		.000	.001		.000	.001
Race X Household Income			.004			.064
Race X Network size			-.001			-.002
Household Income X Network size			-.000			-.000
Race X Household Income X Network size			.000			.000
Intercept	9.212***	7.803***	7.783***	7.914***	6.588***	6.561***
R <sup>2</sup>	.143	.158	.158	.148	.158	.158
Δ R <sup>2</sup>	.143	.015	.000	.148	.010	.000
	MAT			AFT		
	Model 5.79	Model 5.80	Model 5.81	Model 5.82	Model 5.83	Model 5.84
Race	-3.298***	-2.891***	-3.894***	-2.476***	-2.308***	-2.587***
Household Income		1.365***	1.481***		.714***	.759***
Network size		.001***	.009**		.002**	.006**
Race X Household Income			.357			.192
Race X Network size			.005			-.001
Household Income X Network size			-.003**			-.001
Race X Household Income X Network size			-.002			-.001
Intercept	40.876***	32.983***	32.656***	32.180***	27.924***	27.785***
R <sup>2</sup>	.090	.111	.111	.163	.178	.178
Δ R <sup>2</sup>	.090	.011	.000	.163	.015	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

The results differed somewhat for the MAT and AFT. In Model 5.80, both household income and network size demonstrated significance. Those with higher household incomes attained higher scores compared to those with lower incomes and those who had larger social networks obtained higher scores compared to those with smaller social networks. However, once again, the subsequent introduction of the three-way interaction term in Model 5.81 did not attain statistical significance. Similar results were obtained when the AFT measure was used. Overall, the interactions among race, household income, and network size did not emerge as statistically significant factors associated with cognitive test performance.

### ***Race, Household Income and Frequency of Contact***

Table 5.5.9 presents the results of OLS regressions for cognitive tests involving race, household income, and frequency of contact with those in the informal network. In Model 5.86, both household income and frequency of contact showed a significant association with Rey-I scores. Those with higher household incomes attained higher scores compared to those with lower incomes. Frequency of contact also showed a positive correlation with Rey-I scores, indicating that individuals with more frequent contact with others in their social networks achieved higher scores compared to those with less frequent contact. However, the introduction of the three-way interaction term (race x household income x frequency of contact) in Model 5.87 did not reveal a statistically significant association with Rey-I scores and did not enhance explanatory power. Similar results were obtained for each of the other three measures. Overall, therefore, these results suggest that frequency of contact did not moderate the relationship between race, household income and cognitive test performance.

**Table 5.5.9: Interaction Effect of Race, Household Income and Frequency of Contact on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.85	Model 5.86	Model 5.87	Model 5.88	Model 5.89	Model 5.90
Race	-.410***	-.345***	-.033	-.437***	-.377***	.058
Household Income		.240***	.356***		.221***	.329***
Frequency of Contact		.007*	.029**		.005*	.025**
Race X Household Income			-.037			-.109
Race X Frequency of Contact			-.022			-.040
Household Income X Frequency of Contact			-.006**			-.006*
Race X Household Income X Frequency of Contact			.003			.001
Intercept	9.212***	7.692***	7.342***	7.914***	6.519***	6.199***
R <sup>2</sup>	.143	.159	.159	.148	.158	.158
Δ R <sup>2</sup>	.143	.016	.000	.148	.010	.000
	MAT			AFT		
	Model 5.91	Model 5.92	Model 5.93	Model 5.94	Model 5.95	Model 5.96
Race	-3.298***	-2.856***	-1.484	-2.476***	-2.271***	-3.302*
Household Income		1.349***	1.827***		.708***	.725***
Frequency of Contact		.076***	.157***		.034***	.030
Race X Household Income			-.709			-.434
Race X Frequency of Contact			-.117			.051
Household Income X Frequency of Contact			-.028**			-.001
Race X Household Income X Frequency of Contact			.054			.029
Intercept	40.876***	31.647***	30.307***	32.180***	27.458***	27.562***
R <sup>2</sup>	.090	.112	.112	.163	.177	.178
Δ R <sup>2</sup>	.090	.012	.000	.163	.014	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

### ***Race, Household Income and Social Support***

Table 5.5.10 displays the outcomes of OLS regressions for associations involving race, household income, and social support and cognitive functioning. In Model 5.98 both household income and social support were significantly related to Rey-I scores. Individuals with higher incomes attained higher scores compared to those with lower incomes and those who received greater social support obtained higher scores compared to those with lower social support. However, introducing the three-way interaction term (race x household income x social support) in Model 5.99 did not show a statistically significant association with Rey-I scores.

The results were similar when the Rey-II and MAT scores were the outcome variables. However, with AFT scores as the outcome, the interaction term was statistically significant (see Model 5.108). Figure 5.5.2 illustrates that the beneficial impact of household income is most pronounced (i.e., the line slope is steepest) for racial minority groups with high levels of social support. Additionally, the enhancement in the effect of household income on AFT scores, associated with an increase from low to high social support, is more significant among racial minorities than among whites. Thus, social support amplifies the positive effects of household income more for racial minorities than for whites. This indicates that social support can reduce racial disparities in cognitive functioning when there is an equivalent increase in household income across racial groups. Overall, therefore, social support was found to moderate the relationship between race, income and AFT cognitive test scores, but not with regard to the other three cognitive tests.

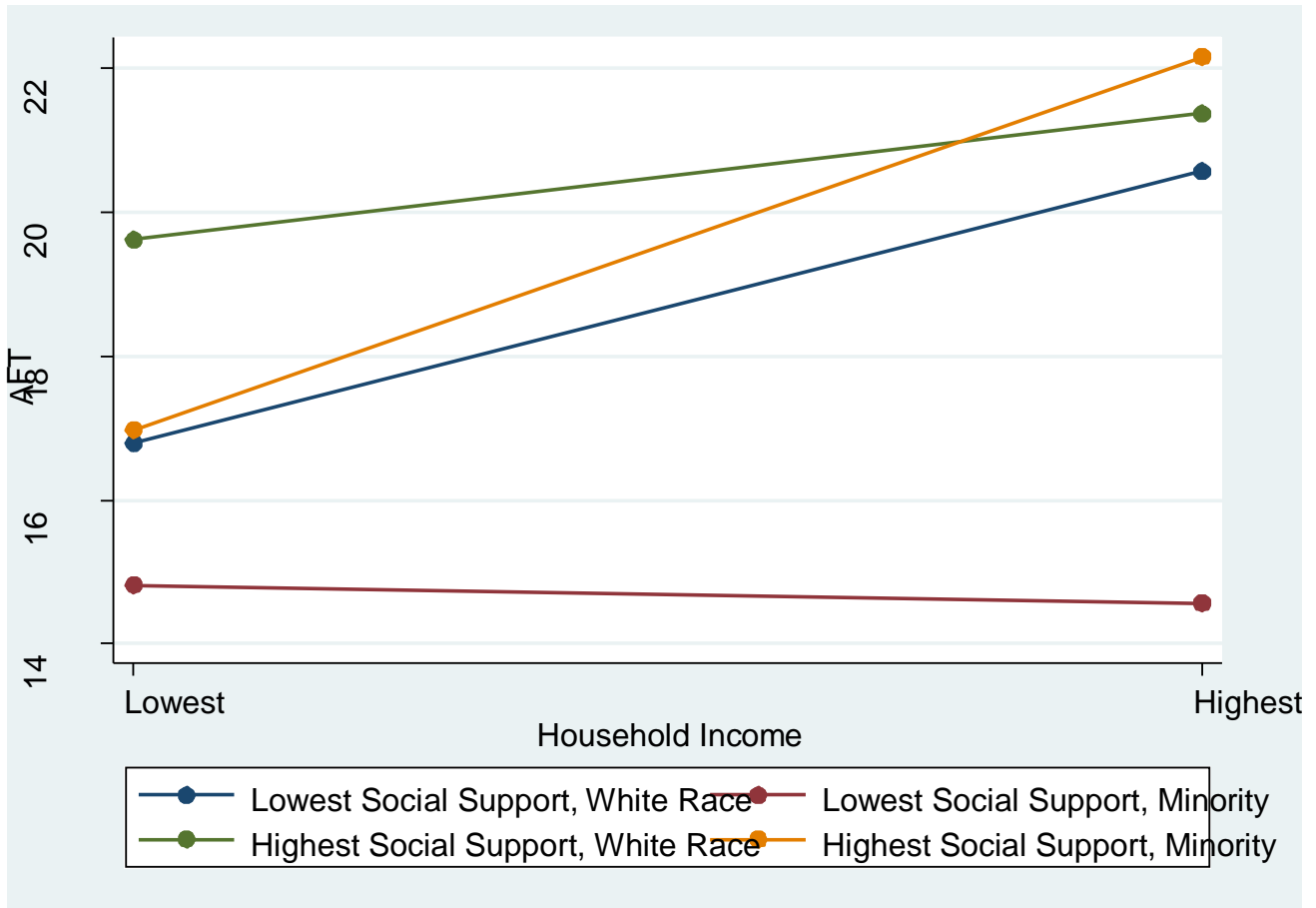
**Table 5.5.10: Interaction Effect of Race, Household Income and Social Support on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.97	Model 5.98	Model 5.99	Model 5.100	Model 5.101	Model 5.102
Race	-.410***	-.323***	-.371	-.437***	-.354***	-.204
Household Income		.212***	.310		.192***	.322
Social Support		.007***	.010		.007***	.011
Race X Household Income			.065			-.046
Race X Social Support			-.000			-.005
Household Income X Social Support			-.001**			-.001**
Race X Household Income X Social Support			-.001			.002
Intercept	9.212***	7.356***	7.097***	7.914***	6.142***	5.809***
R <sup>2</sup>	.143	.161	.162	.148	.160	.161
△ R <sup>2</sup>	.143	.018	.001	.148	.012	.001
	MAT			AFT		
	Model 5.103	Model 5.104	Model 5.105	Model 5.106	Model 5.107	Model 5.108
Race	-3.298	-2.799***	-1.158	-2.476***	-2.231***	-1.061
Household Income		1.266***	2.119		.655***	.925
Social Support		.023***	.051		.014***	.021
Race X Household Income			-.589			-.935
Race X Social Support			-.029			-.017
Household Income X Social Support			-.010**			-.003**
Race X Household Income X Social Support			.010			.012**
Intercept	40.876***	31.475***	31.083***	32.180***	27.132***	26.516***
R <sup>2</sup>	.090	.113	.113	.163	.178	.179
△ R <sup>2</sup>	.090	.013	.000	.163	.015	.001

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.  
 \*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Figure 5.5.2: Interaction Effect of Race, Household Income and Social Support on AFT Scores**



***Race, Household Income and Social Participation***

Table 5.5.11 displays the outcomes of OLS regressions for cognitive tests involving race, household income, and social participation. Both household income and social participation demonstrated significant relationships with Rey-I scores. Both individuals with higher incomes and those engaged in more social activities achieved higher Rey-I scores. However, the inclusion of the three-way interaction term (race x household income x social participation) in Model

5.111 was not statistically significant. The results were similar when Rey-II scores (Model 5.114) and AFT scores (Model 5.120) served as the dependent variable).

**Table 5.5.11: Interaction Effect of Race, Household Income and Social Participation on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.109	Model 5.110	Model 5.111	Model 5.112	Model 5.113	Model 5.114
Race	-.410***	-.350***	.442	-.437***	-.381***	.416
Household Income		.231***	.400***		.211***	.381***
Social Participation		.156***	.326***		.150***	.326***
Race X Household Income			-.201			-.149
Race X Social Participation			-.294			-.358
Household Income X Social Participation			.058***			-.068***
Race X Household Income X Social Participation			.076			.079
Intercept	9.212***	7.448***	6.961***	7.914***	6.253***	5.760***
R <sup>2</sup>	.143	.161	.161	.148	.159	.160
△ R <sup>2</sup>	.143	.018	.000	.148	.011	.001
	MAT			AFT		
	Model 5.115	Model 5.116	Model 5.117	Model 5.118	Model 5.119	Model 5.120
Race	-3.298***	-2.889***	1.390	-2.476***	-2.286***	-.395
Household Income		1.330***	2.090***		.693***	.808***
Social Participation		.512***	1.276***		.324***	.453***
Race X Household Income			1.261			-.469
Race X Social Participation			-1.698*			-.755
Household Income X Social Participation			-.260***			-.041
Race X Household Income X Social Participation			.507*			.196
Intercept	40.876***	31.795 ***	29.629 ***	32.180 ***	27.304 ***	26.953 ***
R <sup>2</sup>	.090	.112	.113	.163	.178	.179
△ R <sup>2</sup>	.090	.012	.001	.163	.015	.001

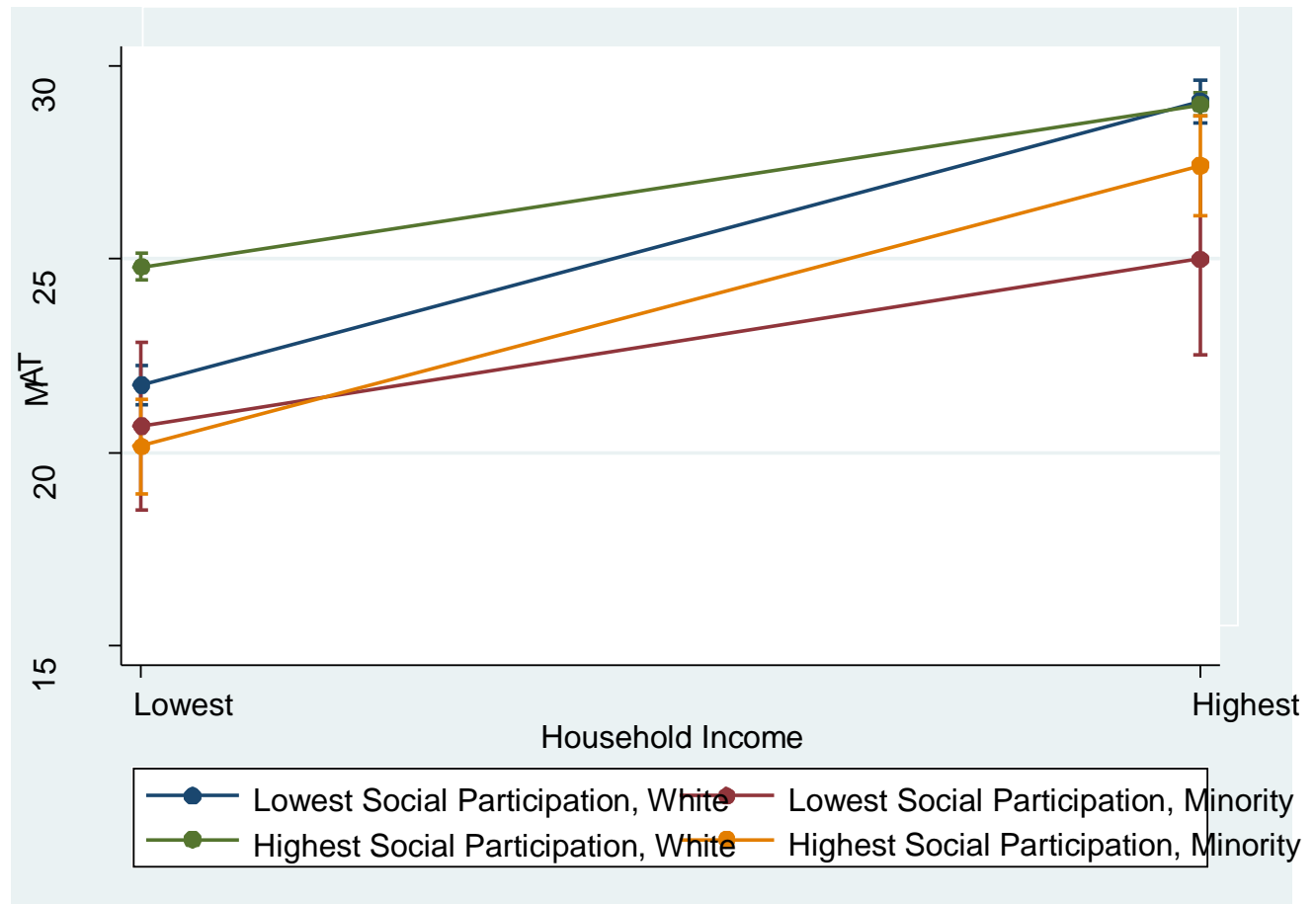
Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

When MAT scores were examined, both household income and social participation once again were significant predictors. In addition, the subsequent introduction of the three-way interaction term in Model 5.117 achieved statistical significance. Post-estimation analyses were performed, revealing distinct patterns for whites and minorities (Figure 5.5.3). It reveals that the beneficial influence of household income on cognitive outcomes is strongest (i.e., the slope is the sharpest) among racial minority groups with extensive social participation. Additionally, the boost in household income's impact on MAT scores, accompanying a shift from low to high social participation, is more pronounced for racial minorities than for whites.

**Figure 5.5.3: Interaction Effect of Race, Household Income and Social Participation on MAT Scores**



Thus, social participation significantly enhances the positive effects of household income to a greater extent for racial minorities than for whites. This indicates that social participation plays a crucial role in lessening racial disparities in cognitive functioning when minorities and whites experience comparable increases in household income which attained statistical significance. Overall, these results suggest that social participation had a moderating effect on the relationship between race, household income and MAT cognitive test scores but not on the other cognitive tests.

### ***Race, Homeownership and Marital Status***

Table 5.5.12 presents the results of OLS regressions investigating the influence of race, homeownership, and marital status on cognitive test outcomes. In Model 5.122, both homeownership and marital status were found to be significantly related to Rey-I scores. Non-homeownership was negatively associated with Rey-I performance, with those who did not own a home reporting lower scores compared to those who did. Marital status was also associated with Rey-I scores such that those who were not currently married/cohabiting obtaining lower scores compared to those who were married. The introduction of the three-way interaction term (race x homeownership x frequency of contact) in Model 5.123 did not reveal a statistically significant association with Rey-I scores. Similar findings emerged in analyses focusing on Rey-II scores (Models 5.125 and 5.126).

Somewhat different results were obtained in analyses of the MAT and AFT measures. Once again, both homeownership and being unmarried were significantly related to each of these outcomes (Models 5.128 and 5.131). However, for these outcomes, the three-way interaction terms achieved statistical significance (Models 5.129 and 5.132).

**Table 5.5.12: Interaction Effect of Race, Homeownership and Marital Status on Cognitive Test Scores**

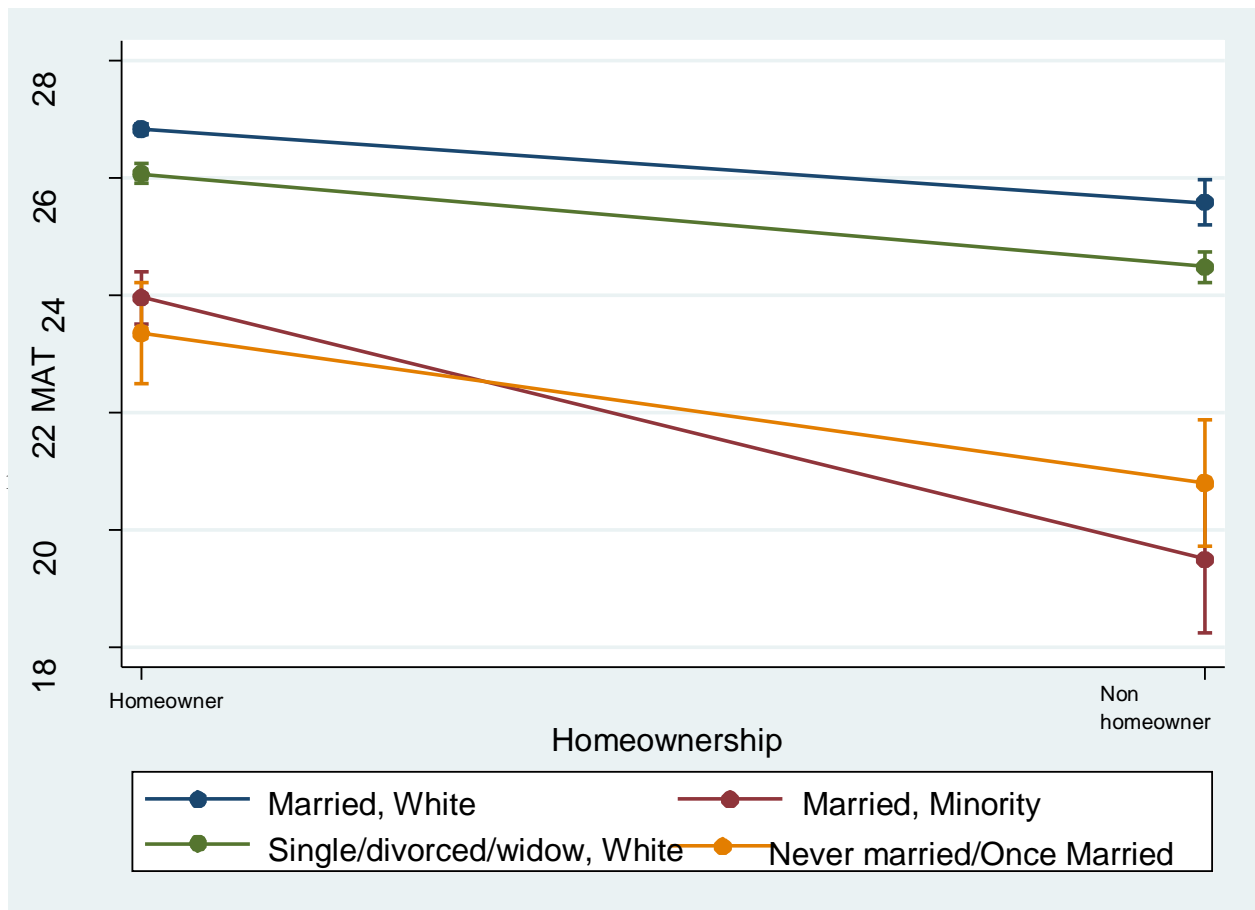
	Rey-I			Rey-II		
	Model 5.121	Model 5.122	Model 5.123	Model 5.124	Model 5.125	Model 5.126
Race	-.410***	-.385***	-.369***	-.437***	-.413***	-.364***
Homeownership		-.376***	-.329***		-.376***	-.301***
Marital Status		-.124***	-.115***		-.098***	-.079***
Race X Homeownership			-.045			-.049
Race X Marital Status			.055			-.012
Homeownership X Marital Status			-.060			-.097
Race X Homeownership X Marital Status			-.226			-.351
Intercept	9.212***	9.099***	9.101***	7.914***	7.809***	7.811***
R <sup>2</sup>	.143	.149	.149	.147	.152	.152
△ R <sup>2</sup>	.143	.006	.000	.147	.005	.000
	MAT			AFT		
	Model 5.127	Model 5.128	Model 5.129	Model 5.130	Model 5.131	Model 5.132
Race	-3.298***	-3.185***	-2.865***	-2.476***	-2.409***	-2.261***
Homeownership		-1.595***	-1.242***		-1.033***	-.852***
Marital Status		-.773***	-.759***		-.183***	-.168**
Race X Homeownership			-3.215***			-1.452***
Race X Marital Status			-.151			-.001
Homeownership X Marital Status			-.345			-.198
Race X Homeownership X Marital Status			2.254*			1.170*
Intercept	40.876***	40.308***	40.345***	32.180***	31.928***	31.944***
R <sup>2</sup>	.090	.097	.097	.163	.167	.168
△ R <sup>2</sup>	.090	.007	.000	.163	.005	.001

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.  
 \*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

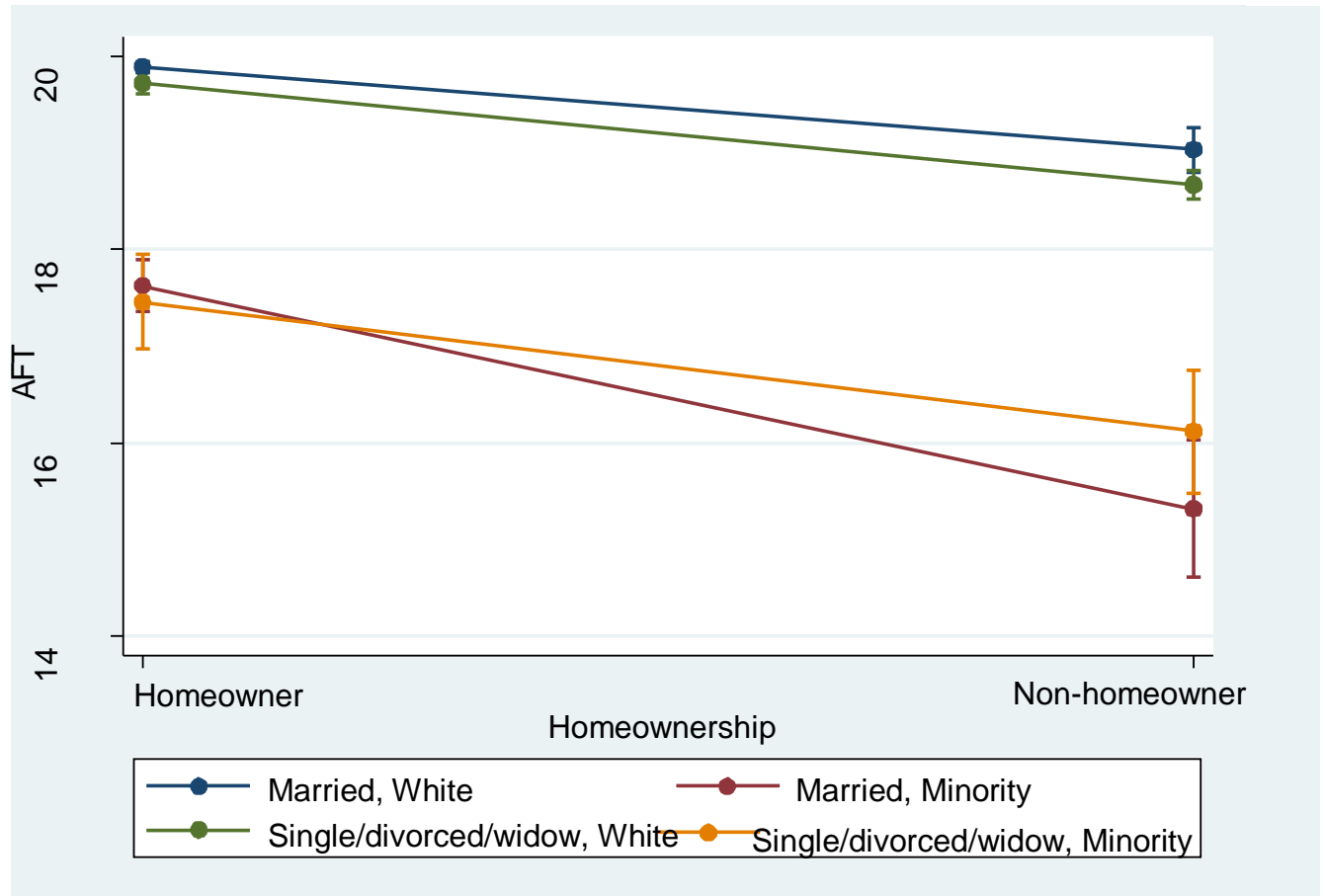
Source: Canadian Longitudinal Study on Aging Baseline Data

Figure 5.5.4 shows that the positive impact of homeownership on MAT scores is most pronounced for married racial minorities, evidenced by the steepest slope of the line in this group. Additionally, the comparative analysis reveals that transitioning from non-homeownership to homeownership yields a greater increase in MAT scores for married racial minorities than for their white counterparts. This suggests that marriage amplifies the beneficial effects of homeownership more significantly among racial minorities. Therefore, in contexts where racial minorities and whites shift similarly from non-homeownership to homeownership, marriage appears to play a role in reducing racial disparities in cognitive outcomes. The findings are the same for the AFT cognitive test, as illustrated in Figure 5.5.5 below.

**Figure 5.5.4: Interaction Effect of Race, Homeownership and Marital Status on MAT Scores**



**Figure 5.5.5: Interaction Effect of Race, Home Ownership and Marital Status on AFT Scores**



Overall, the results indicate that marital status had a moderating effect on the relationships between race, homeownership and both MAT and AFT cognitive test scores but not on the other two cognitive tests.

*Race, Homeownership and Network Size*

Table 5.5.13 showcases the findings from OLS regressions investigating the impact of race, homeownership, and network size on cognitive test outcomes. In Model 5.134,

**Table 5.5.13: Interaction Effect of Race, Homeownership and Network Size on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.133	Model 5.134	Model 5.135	Model 5.136	Model 5.137	Model 5.138
Race	-.410***	-.388***	-.327***	-.437***	-.416***	-.341***
Homeownership		-.424***	-.468***		-.414***	-.431***
Network Size		.000	.000		.000	.000
Race X Homeownership			-.276			-.289
Race X Network Size			-.001			-.000
Homeownership X Network Size			.001			.001
Race X Homeownership X Network Size			.002			.001
Intercept	9.212***	9.1057***	9.116***	7.914***	7.806***	7.814***
R <sup>2</sup>	.143	.148	.149	.147	.151	.151
Δ R <sup>2</sup>	.143	.005	.001	.147	.004	.000
	MAT			AFT		
	Model 5.139	Model 5.140	Model 5.141	Model 5.142	Model 5.143	Model 5.144
Race	-3.298***	-3.190***	-2.831***	-2.476***	-2.437***	-2.074***
Homeownership		-1.898***	-1.931***		-1.099***	-1.202***
Network Size		.001	.000		.003***	.002**
Race X Homeownership			-1.740			-.711
Race X Network Size			-.000			-.004
Homeownership X Network Size			.003			.003
Race X Homeownership X Network Size			-.001			-.002
Intercept	40.876***	40.464***	40.514***	32.180***	31.787***	31.814***
R <sup>2</sup>	.090	.095	.096	.163	.167	.168
Δ R <sup>2</sup>	.090	.005	.001	.163	.007	.001

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

homeownership was significantly related to Rey-I scores. Non-homeownership was negatively associated with performance on the Rey-I with those who did not own a home reporting lower scores. However, network size was not significantly related to such outcomes. The introduction of the three-way interaction term (race x homeownership x network size) in Model 5.135 did not unveil a statistically significant association with Rey-I scores.

Similar findings emerged when either the Rey-II or MAT scores were entered as the dependent variable. Conversely, when AFT scores were used, both homeownership and network size emerged as significantly related (Model 5.143). Non-homeownership was negatively associated with performance on the AFT, with those who did not own a home reporting lower scores. Once again, network size was positively associated, such that those with larger social networks obtaining higher scores. Once again, however, the three-way interaction term (Model 5.144) did not achieve statistical significance. Overall, the three-way interaction among race, homeownership, and network size did not emerge as a statistically significant correlate of cognitive test performance.

### ***Race, Homeownership and Frequency of Contact***

Table 5.5.14 presents the results of OLS regressions investigating associations involving race, homeownership, and frequency of contact with cognitive test outcomes. In Model 5.146, both homeownership and frequency of contact were found to significantly relate to Rey-I scores. Once again, non-homeownership was negatively associated with performance on the Rey-I, with those who did not own their own home reporting lower scores. Frequency of contact was positively associated with Rey-I scores such that those with more frequent contact with people in their social networks obtained higher scores. The introduction of the

**Table 5.5.14: Interaction Effect of Race, Homeownership and Frequency of Contact on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.145	Model 5.146	Model 5.147	Model 5.148	Model 5.149	Model 5.150
Race	-.410***	-.380***	-.400	-.437***	-.410***	-.459
Homeownership		-.417***	-.635***		-.409***	-.452*
Frequency of Contact		.009**	.008*		.006	.005
Race X Homeownership			.407			.162
Race X Frequency of Contact			.003			.005
Homeownership X Frequency of Contact			.013			.003
Race X Homeownership X Frequency of Contact			-.033			-.023
Intercept	9.212***	8.948***	8.986***	7.914***	7.711***	7.725***
R <sup>2</sup>	.143	.149	.149	.147	.151	.152
Δ R <sup>2</sup>	.143	.006	.000	.147	.004	.001
	MAT			AFT		
	Model 5.151	Model 5.152	Model 5.153	Model 5.154	Model 5.155	Model 5.156
Race	-3.298***	-3.148***	-3.693	-2.476***	-2.395***	-4.323***
Homeownership		-1.825***	-2.049		-1.071***	-1.752***
Frequency of Contact		.089***	.082		.040***	.026**
Race X Homeownership			-1.807			-.799
Race X Frequency of Contact			.052			.122***
Homeownership X Frequency of Contact			.019			.043
Race X Homeownership X Frequency of Contact			.006			.013
Intercept	40.876***	38.788***	38.943***	32.180***	31.1919***	31.477***
R <sup>2</sup>	.090	.096	.097	.163	.168	.168
Δ R <sup>2</sup>	.090	.006	.001	.163	.005	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

three-way interaction term (race x homeownership x frequency of contact) in Model 5.147 did not reveal a statistically significant association with Rey-I scores. Similar results were obtained

for each of the other three cognitive functioning measures. Thus, in summary, the interactions among race, homeownership, and frequency of contact did not emerge as statistically significant determinants of cognitive test performances.

### ***Race, Homeownership and Social Support***

Table 5.5.15 illustrates the outcomes of OLS regressions examining how race, homeownership, and social support correlate with cognitive test results. In Model 5.158, both homeownership and social support emerge as significantly related to Rey-I scores. Non-homeownership was negatively associated with performance on the Rey-I with those who did not own a home reporting lower Rey-I scores. Social support was positively associated with Rey-I scores such that those reporting higher social support levels obtained higher scores. The introduction of the three-way interaction term (race x home ownership x social support) in Model 5.159 did not show a statistically significant relationship with Rey-I scores. Once again, the results were similar for each of the other three cognitive outcomes. Overall, these results lead to the conclusion that social support did not moderate the relationship between race, homeownership and cognitive test performance.

### ***Race, Homeownership and Social Participation***

Table 5.5.16 reveals the outcomes of OLS regressions exploring associations involving race, homeownership, and social participation with cognitive test outcomes. In Model 5.158, both homeownership and social participation were significantly related to Rey-I scores. While those who did not own their homes reported lower scores compared to those who did own their homes, social participation was positively associated with Rey-I scores such that those who participated more in social activities obtained higher scores compared to those who participated

less in social activities. The introduction of the three-way interaction term (race x homeownership x social participation) in Model 5.159 exposed a statistically significant relationship with Rey-I scores (Figure 5.5.6).

Figure 5.5.6 illustrates that the beneficial impact of homeownership on Rey-I scores is most significant among individuals in racial minority groups who participate more in social activities, as indicated by the steepest slope of the line for these groups. Additionally, the data show that an increase from low to high social participation enhances the positive effects of homeownership on cognitive scores more for racial minorities than for whites. This suggests that high social participation significantly boosts the advantages of homeownership for minorities, compared to whites. Consequently, active social participation appears to play a crucial role in lessening racial disparities in cognitive performance, particularly when both minorities and whites transition from non-homeownership to homeownership under similar circumstances.

In summary, the findings of this subsection revealed evidence of the moderating effect of social resources on the relationships between primary stressors and cognitive functioning in some cognitive tests. Social participation moderated the effect of racial disparities in education for one cognitive test (Rey-I), racial disparities in household income for one cognitive test (MAT) and disparities in homeownership for one cognitive test (Rey-I). In addition, social support moderated the effect of racial disparities in household income for one cognitive test (AFT). Finally, marital status moderated the effect of racial disparities in homeownership for two cognitive tests (MAT and AFT).

**Table 5.5.15: Interaction Effect of Race, Homeownership and Social Support on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.157	Model 5.158	Model 5.159	Model 5.160	Model 5.161	Model 5.162
Race	-.410***	-.347***	-.293	-.437***	-.375***	-.437***
Homeownership		-.348***	-.471***		-.337***	-.484***
Social Support		.009***	.008***		.009***	.008***
Race X Homeownership			.043			-.063
Race X Social Support			-.000			.001
Homeownership X Social Support			.002			.002
Race X Homeownership X Social Support			-.002			-.002
Intercept	9.212***	8.321***	8.353***	7.914***	7.021***	7.070***
R <sup>2</sup>	.143	.154	.154	.147	.156	.156
△ R <sup>2</sup>	.143	.011	.000	.147	.009	.000
	MAT			AFT		
	Model 5.163	Model 5.164	Model 5.165	Model 5.166	Model 5.167	Model 5.168
Race	-3.298***	-3.029***	-2.660***	-2.476***	-2.325***	-3.829***
Homeownership		-1.577***	-2.365***		-.928***	-1.181***
Social Support		.037***	.034***		.020***	.019***
Race X Homeownership			-1.071			1.117
Race X Social Support			-.000			.021**
Homeownership X Social Support			.012*			.004
Race X Homeownership X Social Support			-.010			-.024
Intercept	40.876***	37.134***	37.382***	32.180***	30.113***	30.271***
R <sup>2</sup>	.090	.100	.100	.163	.171	.171
△ R <sup>2</sup>	.090	.010	.000	.163	.008	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.16: Interaction Effect of Race, Homeownership and Social Participation on Cognitive Test Scores**

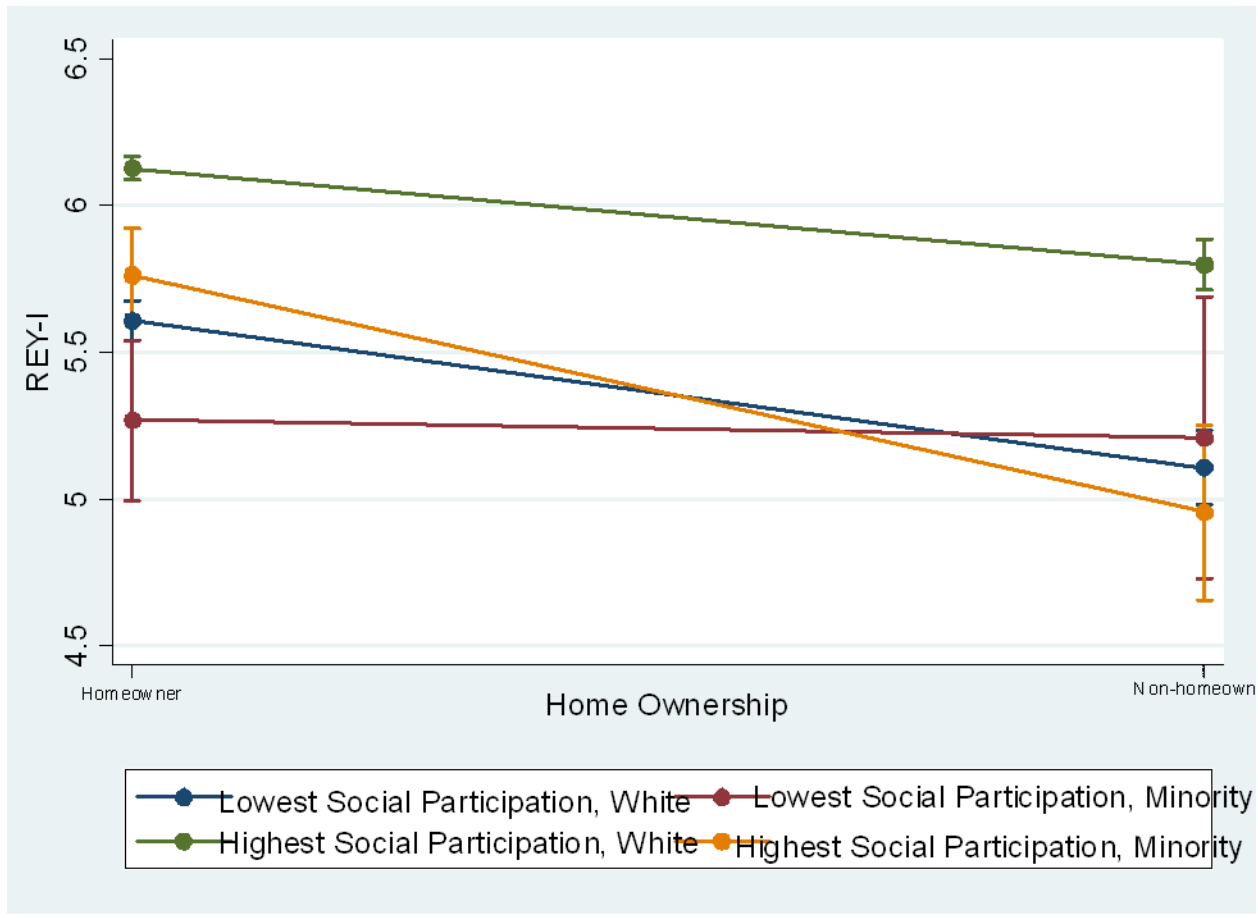
	Rey-I			Rey-II		
	Model 5.169	Model 5.170	Model 5.171	Model 5.172	Model 5.173	Model 5.174
Race	-.410***	-.384***	-.331	-.437***	-.412***	-.035
Homeownership		-.402***	-.557***		-.393***	-.398***
Social Participation		.179***	.173***		.168***	.174***
Race X Homeownership			.748			.150
Race X Social Participation			-.009			-.110
Homeownership X Social Participation			.057			.007
Race X Homeownership X Social Participation			-.306*			-.135
Intercept	9.212***	8.630***	8.654***	7.914***	7.365***	7.350***
R <sup>2</sup>	.143	.152	.152	.147	.153	.154
△ R <sup>2</sup>	.143	.009	.000	.147	.006	.001
	MAT			AFT		
	Model 5.175	Model 5.176	Model 5.177	Model 5.178	Model 5.179	Model 5.180
Race	-3.298***	-3.183***	-2.153*	-2.476***	-2.410***	-1.540**
Homeownership		-1.812***	-1.915***		-1.053***	-1.297***
Social Participation		.683***	.688***		.407***	.403***
Race X Homeownership			-.753			-.368
Race X Social Participation			-.225			-.239
Homeownership X Social Participation			.078			.103
Race X Homeownership X Social Participation			-.386			-.154
Intercept	40.876***	38.609 ***	38.629 ***	32.180 ***	30.836 ***	30.865 ***
R <sup>2</sup>	.090	.098	.098	.163	.169	.169
△ R <sup>2</sup>	.090	.008	.000	.163	.009	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Figure 5.5.6: Interaction Effect of Race, Homeownership and Social Participation on Rey-I Scores**



**The Moderating Effect of Social Resources on Relationships between Secondary Stressors and Cognitive Test Performance**

***Race, SRH and Marital Status***

Table 5.5.17 reports the results of OLS regressions addressing relationships among race, self-rated health, and marital status with cognitive test outcomes. In Model 5.182, once again, SRH was positively associated with performance on the Rey-I, with those who reported higher SRH obtaining higher scores compared to those who reported lower SRH. Marital status also

showed an association with Rey-I scores, with individuals who were unmarried achieving lower scores compared to those who were married or cohabiting. However, the three-way interaction term (race x SRH x marital status) was not significant. Similar results were obtained for each of the other three cognitive functioning measures. This leads to the conclusion that marital status did not appear to have a moderating effect on the relationship between race, SRH and cognitive test performance.

### ***Race, SRH and Network Size***

Table 5.5.18 reveals the outcomes of OLS regressions examining relationships involving race, SRH, and network size with cognitive test outcomes. In Model 5.194, SRH was significantly related to Rey-I scores but network size was not statistically significant. SRH was positively associated with performance on the Rey-I, with those who reported higher SRH obtaining higher cognitive scores compared to those who reported lower SRH. However, the introduction of the three-way interaction term (race x SRH x network size) in Model 5.195 was not significant.

Similar results were evident in analyses of the Rey-II (Models 5.197 and 5.198) and MAT (Models 5.200 and 5.201). Conversely, analyses of the respondents' AFT scores revealed that both SRH and network size were significantly related (Model 5.203). SRH was positively associated with performance on the AFT, with those who reported higher SRH obtaining higher AFT scores compared to those who reported lower SRH. In addition, network size was also positively associated with AFT scores such that those who had larger social networks obtained higher scores compared to those with smaller social networks. Once again, however, the

**Table 5.5.17: Interaction Effect of Race, SRH and Marital Status on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.181	Model 5.182	Model 5.183	Model 5.184	Model 5.185	Model 5.186
Race	-.410***	-.360***	-.307**	-.437***	-.389***	-.111
SRH		.212***	.204***		.207***	-.195***
Marital Status		-.175***	-.113*		-.150***	-.076
Race X SRH			-.015			.093
Race X Marital Status			-.195			-.387
SRH X Marital Status			-.025			-.027
Race X SRH X Marital Status			.055			.088
Intercept	9.212***	9.533 ***	9.516 ***	7.914 ***	8.233 ***	8.204 ***
R <sup>2</sup>	.143	.155	.155	.147	.156	.157
□ R <sup>2</sup>	.143	.012	.000	.147	.009	.001
	MAT			AFT		
	Model 5.187	Model 5.188	Model 5.189	Model 5.190	Model 5.191	Model 5.192
Race	-3.298***	-3.028***	-2.409***	-2.476***	-2.339***	-2.156***
SRH		1.137***	.261***		.608***	.577***
Marital Status		-.944***	-.834***		-.316***	-.080
Race X SRH			-.262			-.078
Race X Marital Status			-1.319			-.863
SRH X Marital Status			-.048			-.098
Race X SRH X Marital Status			.556			.345
Intercept	40.876***	42.578 ***	42.533 ***	32.180 ***	33.166 ***	33.103 ***
R <sup>2</sup>	.090	.107	.107	.163	.174	.174
□ R <sup>2</sup>	.090	.017	.000	.163	.011	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.18: Interaction Effect of Race, SRH and Network Size on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.193	Model 5.194	Model 5.195	Model 5.196	Model 5.197	Model 5.198
Race	-.410***	-.365***	-.519***	-.437***	-.394***	-.259
SRH		.219***	-.228***		.213***	-.225***
Network Size		.000	-.000		.000	-.000
Race X SRH			.069			-.037
Race X Network Size			.003			.001
SRH X Network Size			.000			.000
Race X SRH X Network Size			-.001			-.001
Intercept	9.212***	9.582***	9.602***	7.914***	8.270***	8.296***
R <sup>2</sup>	.143	.153	.153	.147	.155	.155
△ R <sup>2</sup>	.143	.010	.000	.147	.008	.000
	MAT			AFT		
	Model 5.199	Model 5.200	Model 5.201	Model 5.202	Model 5.203	Model 5.204
Race	-3.298***	-3.041***	-3.373***	-2.476***	-2.368***	-2.221***
SRH		1.174***	-1.203***		.619***	-.729***
Network Size		.000	-.001		.002***	-.003
Race X SRH			.179			.056
Race X Network Size			.009			-.004
SRH X Network Size			.001			.002**
Race X SRH X Network Size			-.005			-.001
Intercept	40.876***	42.951***	43.014***	32.180***	33.120***	33.366***
R <sup>2</sup>	.090	.104	.105	.163	.173	.174
△ R <sup>2</sup>	.090	.014	.001	.163	.010	.001

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

interaction term in Model 5.204 did not attain statistical significance. Thus, our results suggest that network size did not have a moderating effect on the relationship between race, SRH and cognitive test performance.

### ***Race, SRH and Frequency of Contact***

Table 5.5.19 reveals the outcomes of OLS regressions exploring the implications of race, SRH, and frequency of contact for cognitive test outcomes. In Model 5.206, SRH and frequency of contact significantly impacted Rey-I scores. Once again, SRH was positively associated with performance on the Rey-I. Frequency of contact with others in one's social network also showed a positive correlation with Rey-I scores. However, the three-way interaction term (race x SRH x frequency of contact) was not significant (Model 5.207). Advancing to the Rey-II, in Model 5.209, SRH was statistically significant but frequency of contact was not. Yet, once again, the three-way interaction term in Model 5.210 did not attain significance. Similarly, when focusing on MAT and AFT scores, although both SRH and frequency of contact were significant predictors, the three-way interaction terms were not (Models 5.213 and 5.216). Thus, in conclusion, frequency of contact did not have a moderating effect on the relationship between race, SRH and cognitive test performance.

### ***Race, SRH and Social Support***

Table 5.5.20 reveals the outcomes of OLS regressions exploring the effects of race, SRH, and social support on cognitive test outcomes. In Model 5.218, both SRH and social support significantly impacted Rey-I scores. SRH was positively associated with performance on the

**Table 5.5.19: Interaction Effect of Race, SRH and Frequency of Contact on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.205	Model 5.206	Model 5.207	Model 5.208	Model 5.209	Model 5.210
Race	-.410***	-.358***	-.380	-.437***	-.388***	-.315
SRH		-.217***	-.267***		.212***	-.236***
Frequency of Contact		.009**	.003		.007	.003
Race X SRH			.033			-.031
Race X Frequency of Contact			.000			.005
SRH X Frequency of Contact			.003			.002
Race X SRH X Frequency of Contact			-.002			-.002
Intercept	9.212***	9.411 ***	9.528 ***	7.914 ***	8.162 ***	8.223 ***
R <sup>2</sup>	.143	.154	.154	.147	.155	.155
△ R <sup>2</sup>	.143	.011	.000	.147	.008	.000
	MAT			AFT		
	Model 5.211	Model 5.212	Model 5.213	Model 5.214	Model 5.215	Model 5.216
Race	-3.298***	-3.006***	-4.999	-2.476***	-2.328***	-4.703***
SRH		1.157***	-1.367***		.613***	-.708***
Frequency of Contact		.086***	.053		.039***	.019
Race X SRH			.334			.048
Race X Frequency of Contact			.122			.128
SRH X Frequency of Contact			.012			.005
Race X SRH X Frequency of Contact			-.021			.002
Intercept	40.876***	41.251 ***	41.839 ***	32.180 ***	32.500 ***	32.879 ***
R <sup>2</sup>	.090	.106	.106	.163	.174	.174
△ R <sup>2</sup>	.090	.016	.000	.163	.011	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

Rey-I with those who reported higher SRH obtaining higher cognitive scores compared to those who reported lower SRH. Social support was also positively associated with Rey-I scores such that those who received greater social support obtained higher scores compared to those with lower levels of social support. The introduction of the three-way interaction term (race x SRH x social support) in Model 5.219 exposed a non-significant effect on Rey-I scores. Similar findings emerged with regard to each of the other three cognitive functioning measures (see Models 5.222, 5.225, 5.228). This leads to the conclusion that social support did not have a moderating effect on the relationship between race, SRH and cognitive test performance.

### ***Race, SRH and Social Participation***

Table 5.5.21 reveals the outcomes of OLS regressions assessing association among race, SRH, and social participation with cognitive test outcomes. Analyses of each of the four cognitive tests revealed similar findings. In each model, both SRH and social participation were significantly and positively associated with cognitive functioning (see Models 5.230, 5.233, 5.236, and 5.239). However, in each case, the three-way interaction term (race x SRH x social participation) was not significant effect (Models 5.231, 5.234, 5.237, 5.240). Once again, therefore, we conclude that the interaction of race, SRH, and social participation was not a statistically significant determinant of cognitive test performance.

**Table 5.5.20: Interaction Effect of Race, SRH and Social Support on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.217	Model 5.218	Model 5.219	Model 5.220	Model 5.221	Model 5.222
Race	-.410***	-.331***	-.529	-.437***	-.359***	-.694
SRH		.190***	.143***		.184***	.145***
Social Support		.008***	.009***		.008***	.009***
Race X SRH			.089			.095
Race X Social Support			.002			.006
SRH X Social Support			-.001			-.000
Race X SRH X Social Support			-.001			-.002
Intercept	9.212***	8.807***	8.678***	7.914***	7.492***	7.393***
R <sup>2</sup>	.143	.158	.158	.147	.158	.158
△ R <sup>2</sup>	.143	.015	.000	.147	.011	.000
	MAT			AFT		
	Model 5.223	Model 5.224	Model 5.225	Model 5.226	Model 5.227	Model 5.228
Race	-3.298***	-2.918***	-4.937*	-2.476***	-2.274***	-5.745***
SRH		1.061***	1.240***		.557***	.731***
Social Support		.031***	.025***		.017***	.011**
Race X SRH			.689			.777
Race X Social Support			.027			.040*
SRH X Social Support			.002			.002
Race X SRH X Social Support			-.009			-.009
Intercept	40.876***	39.878***	40.362***	32.180***	31.544***	32.093***
R <sup>2</sup>	.090	.108	.108	.163	.176	.176
△ R <sup>2</sup>	.090	.018	.000	.163	.013	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.21: Interaction Effect of Race, SRH and Social Participation on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.229	Model 5.230	Model 5.231	Model 5.232	Model 5.233	Model 5.234
Race	-.410***	-.365***	.036	-.437***	-.393***	.562
SRH		.204***	.283***		.198***	.297***
Social Participation		.149***	.085**		.138***	.059
Race X SRH			-.053			-.178
Race X Social Participation			-.131			-.252
SRH X Social Participation			.027*			.035**
Race X SRH X Social Participation			.017			.033
Intercept	9.212***	9.159 ***	9.349 ***	7.914 ***	7.880 ***	8.105 ***
R <sup>2</sup>	.143	.155	.155	.147	.156	.157
Δ R <sup>2</sup>	.143	.012	.000	.147	-.009	.001
	MAT			AFT		
	Model 5.235	Model 5.236	Model 5.237	Model 5.238	Model 5.239	Model 5.240
Race	-3.298***	-3.046***	-2.481	-2.476***	-2.348***	.941
SRH		1.122***	1.585***		.588***	.802***
Social Participation		.498***	.115		.316***	.147
Race X SRH			.139			-.218
Race X Social Participation			-.113			-.485
SRH X Social Participation			.159**			.073
Race X SRH X Social Participation			-.078			.079
Intercept	40.876***	41.481 ***	42.617 ***	32.180 ***	32.348 ***	32.853 ***
R <sup>2</sup>	.090	.106	.106	.163	.174	.174
Δ R <sup>2</sup>	.090	.016	.000	.163	.011	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

### ***Race, SRMH and Marital Status***

Table 5.5.22 reveals the outcomes of regressions examining associations involving race, SRMH, and marital status with cognitive test outcomes. In Model 5.242, both SRMH and marital status significantly impacted Rey-I scores, SRMH was positively associated with performance on the Rey-I. With regard to marital status, individuals who were not married achieved lower scores compared to those who were married. The introduction of the three-way interaction term (race x SRMH x marital status) in Model 5.243 was not significant. Once again, similar results were evident when the Rey-II, the MAT, and the AFT were included as dependent variables (Models 5.246, 5.249, 5.252). In conclusion, the interaction of race, SRMH, and marital status was not a statistically significant correlate of cognitive functioning, regardless of the test used.

### ***Race, SRMH and Network Size***

Table 5.5.23 provides insights from OLS regressions investigating the intersection of race, SRMH, and network size in relation to cognitive test outcomes. In Model 5.254, SRMH was significantly and positively associated with Rey-I test performance while network size lacked statistical significance. However, the introduction of the three-way interaction term (race x SRMH x network size) in Model 5.255 failed to yield evidence of its significant effects on Rey-I scores. Similar findings were obtained when both the Rey-II and MAT were used as dependent variables. However, analyses focusing on the AFT revealed that both SRMH and network size were positively associated with AFT scores. Once again, however, the interaction term was not statistically significant (Model 5.264). In conclusion, the evidence suggests that network size did not have a moderating effect on the relationship between race, SRMH and cognitive functioning.

**Table 5.5.22: Interaction Effect of Race, SRMH and Marital Status on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.241	Model 5.242	Model 5.243	Model 5.244	Model 5.245	Model 5.246
Race	-.410***	-.386***	-.253	-.437***	-.415***	-.651**
SRMH		.223***	.217***		.228***	.209***
Marital Status		-.168***	-.241**		-.140***	-.309**
Race X SRMH			-.029			.074
Race X Marital Status			-.013			.254
SRMH X Marital Status			-.019			.056
Race X SRMH X Marital Status			-.014			-.113
Intercept	9.212***	8.262 ***	8.284 ***	7.914 ***	6.949 ***	7.024 ***
R <sup>2</sup>	.143	.154	.154	.147	.156	.156
△ R <sup>2</sup>	.143	.011	.000	.147	.009	.000
	MAT			AFT		
	Model 5.247	Model 5.248	Model 5.249	Model 5.250	Model 5.251	Model 5.252
Race	-3.298***	-3.178***	-4.057***	-2.476***	-2.428***	-2.479***
SRMH		1.204***	1.223		.561***	.545***
Marital Status		-.902***	-.646		-.314***	-.478*
Race X SRMH			.223			.013
Race X Marital Status			1.636			.019
SRMH X Marital Status			-.067			.043
Race X SRMH X Marital Status			-.419			-.007
Intercept	40.876***	35.726 ***	35.638 ***	32.180 ***	29.819 ***	29.886 ***
R <sup>2</sup>	.090	.107	.107	.163	.171	.171
△ R <sup>2</sup>	.090	.017	.000	.163	.008	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.23: Interaction Effect of Race, SRMH and Network Size on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.253	Model 5.254	Model 5.255	Model 5.256	Model 5.257	Model 5.258
Race	-.410***	-.390***	.129	-.437***	-.417***	-.104
SRMH		.230***	.248***		.234***	.260***
Network Size		.000	.001		.000	.003
Race X SRMH			-.131			-.072
Race X Network Size			-.008			-.009
SRMH X Network Size			-.000			-.001
Race X SRMH X Network Size			.002			.002
Intercept	9.212***	8.276***	8.206***	7.914***	6.959***	6.856***
R <sup>2</sup>	.143	.153	.153	.147	.155	.155
△ R <sup>2</sup>	.143	.010	.000	.147	.008	.000
	MAT			AFT		
	Model 5.259	Model 5.260	Model 5.261	Model 5.262	Model 5.263	Model 5.264
Race	-3.298***	-3.186***	-2.570	-2.476***	-2.455***	-2.296**
SRMH		1.249***	1.313***		.573***	.667***
Network Size		-.000	.005		.002**	.011**
Race X SRMH			-.126			.032
Race X Network Size			-.017			-.005
SRMH X Network Size			-.002			-.002**
Race X SRMH X Network Size			.004			-.000
Intercept	40.876***	35.897***	35.641***	32.180***	29.729***	29.343***
R <sup>2</sup>	.090	.105	.105	.163	.171	.171
△ R <sup>2</sup>	.090	.015	.000	.163	.008	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

### ***Race, SRMH and Frequency of Contact***

Table 5.5.24 reveals the outcomes of OLS regressions exploring associations among race, SRMH, and frequency of contact with those in one's social network with cognitive test outcomes. In Model 5.266, both SRMH and frequency of contact were significantly and positively associated with Rey-I scores. The introduction of the three-way interaction term (race x SRMH x frequency of contact) in Model 5.267 was not significant. The results were similar with regard to each of the other three cognitive outcome measures. The only exception was that frequency of contact did not emerge as a significant predictor of Rey-II scores. Overall, therefore, frequency of contact did not appear to have a moderating effect on the relationship between race, SRMH and cognitive test performance.

### ***Race, SRMH and Social Support***

Table 5.5.25 reveals the outcomes of OLS regressions assessing relationships between race, SRMH, and social support with cognitive test outcomes. In Model 5.278, both SRMH and social support emerge as significantly and positively associated with Rey-I scores. However, the introduction of the three-way interaction term (race x SRMH x social support) in Model 5.279 was not significant. Similar results were obtained when the Rey-II was used as an outcome.

The findings differed somewhat when focusing on both MAT and AFT scores. With regard to the MAT, Model 5.284 indicates that SRMH was positively associated with MAT scores while social support was not. However, once again, the subsequent inclusion of the three-way interaction term in Model 5.285 did not achieve statistical significance. Conversely, Model 5.287 focusing on AFT scores as an outcome revealed that both SRMH and social support were

**Table 5.5.24: Interaction Effect of Race, SRMH and Frequency of Contact on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.265	Model 5.266	Model 5.267	Model 5.268	Model 5.269	Model 5.270
Race	-.410***	-.384***	-.257	-.437***	-.413***	-.655***
SRMH		.228***	.268***		.233***	.292***
Frequency of Contact		.009**	.018		.006	.019
Race X SRMH			-.029			.048
Race X Frequency of Contact			.001			.007
SRMH X Frequency of Contact			-.002			-.003
Race X SRMH X Frequency of Contact			-.000			-.001
Intercept	9.212***	8.111***	7.957***	7.914***	6.856***	6.634***
R <sup>2</sup>	.143	.153	.153	.147	.155	.155
□ R <sup>2</sup>	.143	.010	.000	.147	.008	.000
	MAT			AFT		
	Model 5.271	Model 5.272	Model 5.273	Model 5.274	Model 5.275	Model 5.276
Race	-3.298***	-3.157***	-5.383	-2.476***	-2.418***	-4.330
SRMH		1.229***	1.129***		.567***	.583**
Frequency of Contact		.085***	.058		.041***	.036
Race X SRMH			.214			-.105
Race X Frequency of Contact			.123			.118
SRMH X Frequency of Contact			.006			-.001
Race X SRMH X Frequency of Contact			-.010			.005
Intercept	40.876***	34.281***	34.759***	32.180***	29.106***	29.197***
R <sup>2</sup>	.090	.106	.106	.163	.171	.172
□ R <sup>2</sup>	.090	.016	.000	.163	.008	.001

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.25: Interaction Effect of Race, SRMH and Social Support on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.277	Model 5.278	Model 5.279	Model 5.280	Model 5.281	Model 5.282
Race	-.410***	-.357***	.004	-.437***	-.417***	.573
SRMH		.192***	.113**		.234***	.171***
Social Support		.007***	.003		.000***	.006**
Race X SRMH			-.093			-.289
Race X Social Support			-.003			-.015
SRMH X Social Support			.001			.000
Race X SRMH X Social Support			.000			.004
Intercept	9.212***	7.743 ***	8.021 ***	7.914 ***	6.959 ***	6.530 ***
R <sup>2</sup>	.143	.157	.157	.147	.155	.158
△ R <sup>2</sup>	.143	.014	.000	.147	.008	.003
	MAT			AFT		
	Model 5.283	Model 5.284	Model 5.285	Model 5.286	Model 5.287	Model 5.288
Race	-3.298***	1.249***	-.290	-2.476***	-2.455***	.564
SRMH		3.186***	.724***		.573***	.474***
Social Support		.000	.009		.002**	.015**
Race X SRMH			-.819			-1.190
Race X Social Support			-.041			-.035
SRMH X Social Support			.004**			.000
Race X SRMH X Social Support			.012			.015**
Intercept	40.876***	35.897 ***	35.246 ***	32.180 ***	29.729 ***	28.759 ***
R <sup>2</sup>	.090	.105	.107	.163	.171	.173
△ R <sup>2</sup>	.090	.015	.002	.163	.008	.002

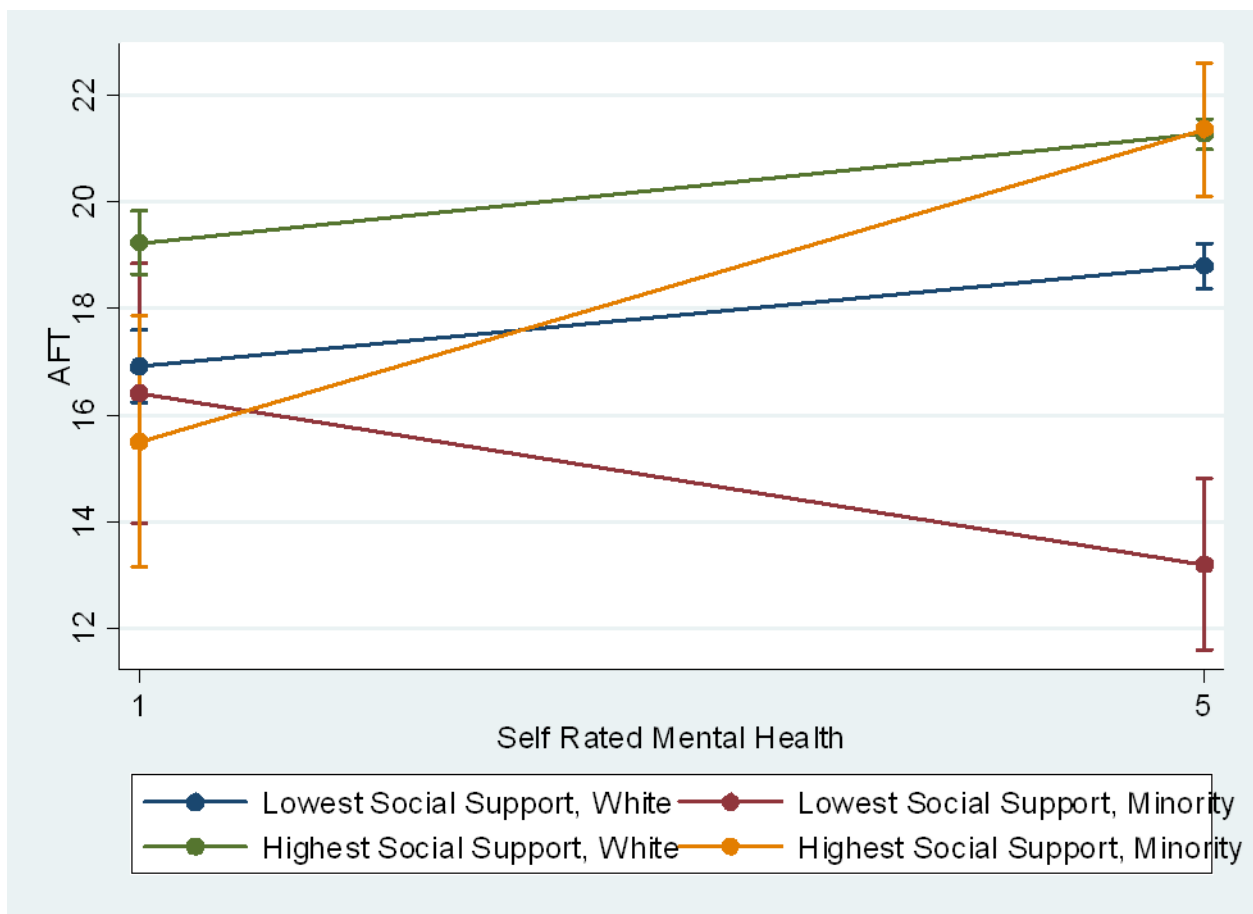
Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

significant as predictors, with both being positively associated with this cognitive performance measure. The interaction term in Model 5.288 also attained statistical significance, suggesting that social support had a moderating effect on the relationship between race, SRMH and AFT cognitive test scores.

**Figure 5.5.7: Interaction Effect of Race, SRMH and Social Support on AFT Scores**



The interaction effect is portrayed graphically in Figure 5.5.7. It shows that the positive impact of self-rated mental health on AFT scores is most pronounced for racial minorities with

high levels of social support, as indicated by the differences in the slopes. Furthermore, the data reveal that an increase in social support—from low to high—significantly augments the benefits of good self-rated mental health on cognitive scores more for racial minorities than for whites. This indicates that strong social support enhances the positive effects of self-rated mental health substantially more for racial minorities. Therefore, social support plays a crucial role in reducing racial disparities in cognitive functioning, particularly when both minorities and whites experience similar improvements in self-rated mental health.

### ***Race, SRMH and Social Participation***

Table 5.5.26 unveils the results of OLS regressions finding out the impacts of race, SRMH, and social participation on cognitive test outcomes. In Model 5.290, SRMH and social participation emerge as significantly and positively associated with Rey-I scores. Once again, however, the introduction of the three-way interaction term (race x SRMH x social participation) in Model 5.291 failed to reveal significant effects. The same was true with regard to each of the other three cognitive functioning measures. Thus, there was little evidence to suggest that social participation had a moderating effect on the relationships between race, SRMH and cognitive test performance.

### ***Race, Life Satisfaction and Marital Status***

Table 5.5.27 reveals the outcomes of regressions focusing in the effects of race, life satisfaction, and marital status on cognitive test outcomes. Once again, the findings reveal that both life satisfaction and marital status were significantly associated with cognitive functioning (Models 5.302, 5.305, 5.308, 5.311). Life satisfaction was positively associated with cognitive performance, such that those who reported higher life satisfaction obtained higher scores

compared to those who reported lower life satisfaction. Marital status also showed an association with cognitive functioning, with individuals who were not married achieving lower scores compared to those who were married. However, the three-way interaction term (race x life satisfaction x marital status) was not significant (see Models 5.303, 5.306, 5.309, 5.312). This suggests that marital status did not moderate the relationships involving race, life satisfaction and cognitive functioning.

### ***Race, Life Satisfaction and Network Size***

Table 5.5.28 showed the effects of race, life satisfaction, and network size on cognitive test outcomes. Life satisfaction was positively associated with Rey-I scores (Model 5.314) while social network size was unrelated. The introduction of the three-way interaction term (race x life satisfaction x network size) was also not significant (Model 5.315). This was also the case in analyses focusing on each of the other cognitive outcome measures (see Models 5.318, 5.321, 5.324).

### ***Race, Life Satisfaction and Frequency of Contact***

Table 5.5.29 reveals the outcomes of regressions investigating the effects of race, life satisfaction, and frequency of contact with others in one's social network on cognitive test outcomes. For three of the four cognitive outcomes, both life satisfaction and frequency of contact were significantly and positively correlated with cognitive functioning (Models 5.326, 5.332 and 5.335). The model focusing on predictors of Rey-II scores was an exception, with the results indicating a positive relationship with life satisfaction but not frequency of contact

**Table 5.5.26: Interaction Effect of Race, SRMH and Social Participation on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.289	Model 5.290	Model 5.291	Model 5. 5.292	Model 5. 5.293	Model 5.294
Race	-.410***	-.389***	.854	-.437***	-.416***	.447
SRMH		.216***	.222***		.221***	.259***
Social Participation		.158***	.167**		.144***	.205**
Race X SRMH			-.273			-.118
Race X Social Participation			-.386			-.359
SRMH X Social Participation			-.001			-.014
Race X SRMH X Social Participation			.083			.058
Intercept	9.212***	7.898***	7.867***	7.914***	6.615***	6.448***
R <sup>2</sup>	.143	.155	.155	.147	.157	.157
Δ R <sup>2</sup>	.143	.012	.000	.147	.010	.000
	MAT			AFT		
	Model 5.295	Model 5.296	Model 5.297	Model 5.298	Model 5.299	Model 5.300
Race	-3.298***	-3.192***	3.007	-2.476***	-2.434***	1.522
SRMH		1.199***	1.474***		.544***	.692***
Social Participation		.546***	.925***		.355***	.563***
Race X SRMH			-1.458			-.857
Race X Social Participation			-2.225			-1.384*
SRMH X Social Participation			-.096			-.051
Race X SRMH X Social Participation			.524			.301
Intercept	40.876***	34.522***	33.446***	32.180***	28.992***	28.396***
R <sup>2</sup>	.090	.106	.106	.163	.172	.172
Δ R <sup>2</sup>	.090	.016	.000	.163	.009	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.27: Interaction Effect of Race, Life Satisfaction and Marital Status on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.301	Model 5.302	Model 5.303	Model 5.304	Model 5.305	Model 5.306
Race	-.410***	-.386***	-.235	-.437***	-.412***	-.317
Life Satisfaction		.020***	.019***		.021***	.019***
Marital Status		-.132***	-.227**		-.106***	-.244**
Race X Life Satisfaction			-.005			-.002
Race X Marital Status			-.131			-.159
Life Satisfaction X Marital Status			.004			.005
Race X Life Satisfaction X Marital Status			.003			.000
Intercept	9.212***	8.571***	8.614***	7.914***	7.277***	7.346***
R <sup>2</sup>	.143	.149	.149	.147	.152	.152
△ R <sup>2</sup>	.143	.006	.000	.147	.005	.000
	MAT			AFT		
	Model 5.307	Model 5.308	Model 5.309	Model 5.310	Model 5.311	Model 5.312
Race	-3.298***	-3.119***	-3.918***	-2.476***	-2.380***	-2.352***
Life Satisfaction		.103***	.092***		.050***	.047***
Marital Status		-.754***	-1.434***		-.234***	-.414
Race X SRMH			.027			-.002
Race X Marital Status			.800			-.626
Life Satisfaction X Marital Status			.025			.007
Race X Life Satisfaction X Marital Status			-.024			.027
Intercept	40.876***	37.681***	38.046***	32.180***	30.700***	30.805***
R <sup>2</sup>	.090	.098	.098	.163	.167	.167
△ R <sup>2</sup>	.090	.008	.000	.163	.005	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.  
 \*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

(Model 5.329). Nevertheless, in all four cases, the introduction of the three-way interaction term (race x life satisfaction x frequency of contact) was not significant (Models 5.327, 5.330, 5.333, 5.336). Thus, there was no evidence to indicate that frequency of contact differentially moderated the negative effect of lower life satisfaction on cognitive test performance among whites and racial minorities.

### ***Race, Life Satisfaction and Social Support***

Table 5.5.30 presents the results of regressions examining the impact of race, life satisfaction, and social support on cognitive test outcomes. In each model, both life satisfaction and social support emerged as significant correlates, with each found to be positively associated with cognitive functioning (Models 5.338, 5.341, 5.344, and 5.347). Nonetheless, in each case, the three-way interaction term did not exhibit statistical significance (see Models 5.339, 5.342, 5.345, 5.348).

### ***Race, Life Satisfaction and Social Participation***

Table 5.5.31 reveals the outcomes of regressions addressing the effects of race, life satisfaction, and social participation on cognitive test outcomes. In each case, life satisfaction and social participation were positively associated with cognitive functioning (see Models 5.350, 5.353, 5.356, 5.359). However, there was no evidence of a significant three-way interaction effect (race x life satisfaction x social participation – see Models 5.351, 5.354, 5.357, and 5.360). In conclusion, therefore, it appears that social participation did not moderate associations between race, life satisfaction and cognitive test performance.

**Table 5.5.28: Interaction Effect of Race, Life Satisfaction and Network Size on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.313	Model 5.314	Model 5.315	Model 5.316	Model 5.317	Model 5.318
Race	-.410***	-.387***	-.131	-.437***	-.413***	-.221
Life Satisfaction		.023***	.023***		.023***	.023***
Network Size		.000	-.000		.000	.000
Race X Life Satisfaction			-.009			-.006
Race X Network Size			-.003			-.003
Life Satisfaction X Network Size			.000			.000
Race X Life Satisfaction X Network Size			.000			.000
Intercept	9.212***	8.547***	8.555***	7.914***	7.253***	7.252***
R <sup>2</sup>	.143	.148	.148	.147	.151	.151
△ R <sup>2</sup>	.143	.005	.000	.147	.004	.000
	MAT			AFT		
	Model 5.319	Model 5.320	Model 5.321	Model 5.322	Model 5.323	Model 5.324
Race	-3.298***	-3.113***	-2.284	-2.476***	-2.402***	-2.217**
Life Satisfaction		.116***	.122***		.053***	.055***
Network Size		-.000	.004		.002**	.004
Race X Life Satisfaction			-.0277			.002
Race X Network Size			-.023			-.008
Life Satisfaction X Network Size			-.000			-.000
Race X Life Satisfaction X Network Size			.001			.000
Intercept	40.876***	37.613***	37.450***	32.180***	30.548***	30.489***
R <sup>2</sup>	.090	.096	.096	.163	.167	.167
△ R <sup>2</sup>	.090	.006	.000	.163	.004	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.29: Interaction Effect of Race, Life Satisfaction and Frequency of Contact on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.325	Model 5.326	Model 5.327	Model 5.328	Model 5.329	Model 5.330
Race	-.410***	-.383***	.026	-.437***	-.410***	-.408
Life Satisfaction		.023***	.022		.023***	.024**
Frequency of Contact		.008*	.006		.005	.007
Race X Life Satisfaction			-.014			-.002
Race X Frequency of Contact			-.019			.000
Life Satisfaction X Frequency of Contact			.000			-.000
Race X Life Satisfaction X Frequency of Contact			.001			.000
Intercept	9.212***	8.408***	8.433***	7.914***	7.178***	7.140***
R <sup>2</sup>	.143	.148	.148	.147	.151	.151
△ R <sup>2</sup>	.143	.005	.000	.147	.004	.000
	MAT			AFT		
	Model 5.331	Model 5.332	Model 5.333	Model 5.334	Model 5.335	Model 5.336
Race	-3.298***	-3.091***	-4.216	-2.476***	-2.368***	-6.595**
Life Satisfaction		.111***	.185***		.052***	.067**
Frequency of Contact		.081***	.194**		.037***	.052
Race X SRMH			.005			.077
Race X Frequency of Contact			.057			.255
Life Satisfaction X Frequency of Contact			-.004			-.001
Race X Life Satisfaction X Frequency of Contact			.000			-.005
Intercept	40.876***	36.132***	34.209***	32.180***	30.006***	29.750***
R <sup>2</sup>	.090	.097	.097	.163	.167	.167
△ R <sup>2</sup>	.090	.007	.000	.163	.004	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.  
 \*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.30: Interaction Effect of Race, Life Satisfaction and Social Support on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.337	Model 5.338	Model 5.339	Model 5.340	Model 5.341	Model 5.342
Race	-.410***	-.362***	-.090	-.437***	-.387***	.573
Life Satisfaction		.014***	-.004		.014***	.005
Social Support		.008***	.002		.008***	.005*
Race X Life Satisfaction			-.010			-.045
Race X Social Support			-.000			-.013
Life Satisfaction X Social Support			.000***			.000
Race X Life Satisfaction X Social Support			.000			.001
Intercept	9.212***	8.071***	8.511***	7.914***	6.783***	7.001***
R <sup>2</sup>	.143	.152	.152	.147	.154	.154
△ R <sup>2</sup>	.143	.009	.000	.147	.008	.000
	MAT			AFT		
	Model 5.343	Model 5.344	Model 5.345	Model 5.346	Model 5.347	Model 5.348
Race	-3.298***	-3.027***	.358	-2.476***	-2.322***	-1.409
Life Satisfaction		.083***	.064**		.034***	.028
Social Support		.029***	.023**		.018***	.015**
Race X Life Satisfaction			-.142			-.095
Race X Social Support			-.053			-.010
Life Satisfaction X Social Support			.000			.000
Race X Life Satisfaction X Social Support			.002			.001
Intercept	40.876***	35.788***	36.233***	32.180***	29.538***	29.756***
R <sup>2</sup>	.090	.099	.099	.163	.169	.169
△ R <sup>2</sup>	.090	.009	.000	.163	.006	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.  
 \*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

### ***Race, Depression and Marital Status***

Table 5.5.32 reveals the results of regressions of cognitive test outcomes on race, depression, and marital status. For each cognitive measure, depression and marital status were negatively associated with performance levels, with those who reported more depressive symptoms and who were not married obtaining lower scores compared to those who reported fewer depressive symptoms and were married (Models 5.362, 5.365, 5.368, 5.372). Yet, in each case, the three-way interaction term (race x depression x marital status) was not significant, indicating that marital status did not moderate relationships involving race, depression and cognitive test performance.

### ***Race, Depression and Network Size***

Table 5.5.33 reveals the outcomes of regressions addressing the effects of race, depression and network size on cognitive test outcomes. For each outcome, depression was negatively associated with cognitive performance levels (Models 5.374, 5.377, 5.380, 5.383). Conversely, network size was non-significant for three of the four outcomes. The exception involved AFT scores, where those reporting larger social networks also reported better cognitive functioning (Model 5.382). Once again, however, the three-way interaction term (race x depression x network size) was not significant in any of the models (Models 5.375, 5.378, 5.381, 5.384). Thus, network size did not moderate relationships between race, depression and cognitive test performance.

**Table 5.5.31: Interaction Effect of Race, Life Satisfaction and Social Participation on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.349	Model 5.350	Model 5.351	Model 5.352	Model 5.353	Model 5.354
Race	-.410***	-.389***	.879	-.437***	-.415***	1.016
Life Satisfaction		.020***	.022***		.020***	.025***
Social Participation		.157***	.177***		.143***	.193***
Race X Life Satisfaction			-.041			-.039
Race X Social Participation			-.420			-.515*
Life Satisfaction X Social Participation			-.001			-.002
Race X Life Satisfaction X Social Participation			.014			.015
Intercept	9.212***	8.189***	8.130***	7.914***	6.933***	6.797***
R <sup>2</sup>	.143	.150	.150	.147	.153	.153
△ R <sup>2</sup>	.143	.007	.000	.147	.006	.000
	MAT			AFT		
	Model 5.355	Model 5.356	Model 5.357	Model 5.358	Model 5.359	Model 5.360
Race	-3.298***	-3.131***	-.190	-2.476***	-2.388***	-1.085
SRMH		.106***	.139***		.048***	.070***
Social Participation		.559***	.897***		.356***	.587***
Race X Life Satisfaction			-.078			-.021
Race X Social Participation			-1.195			-.559
Life Satisfaction X Social Participation			-.012			-.008
Race X Life Satisfaction X Social Participation			.034			.011
Intercept	40.876***	36.285***	35.362***	32.180***	29.843***	29.207***
R <sup>2</sup>	.090	.098	.098	.163	.168	.168
△ R <sup>2</sup>	.090	.008	.000	.163	.005	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.32: Interaction Effect of Race, Depression and Marital Status on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.361	Model 5.362	Model 5.363	Model 5.364	Model 5.365	Model 5.366
Race	-.410***	-.385***	-.361***	-.437***	-.418***	-.298***
Depression		-.036***	-.035***		-.038***	-.037***
Marital Status		-.156***	-.136***		-.127***	-.109**
Race X Depression			-.001			-.012
Race X Marital Status			-.093			-.259
Depression X Marital Status			-.003			-.002
Race X Depression X Marital Status			.005			.014
Intercept	9.212***	9.301 ***	9.297 ***	7.914 ***	8.020 ***	8.014 ***
R <sup>2</sup>	.143	.152	.152	.147	.154	.154
△ R <sup>2</sup>	.143	.009	.000	.147	.007	.000
	MAT			AFT		
	Model 5.367	Model 5.368	Model 5.369	Model 5.370	Model 5.371	Model 5.372
Race	-3.298***	-3.113***	-2.637***	-2.476***	-2.379***	-2.171 ***
Depression		-.191***	-.177***		-.097***	-.090***
Marital Status		-.850***	-.717***		-.264***	-.194*
Race X Depression			-.096*			-.039
Race X Marital Status			-.321			-.086
Depression X Marital Status			-.025			-.012
Race X Depression X Marital Status			.087			-.023
Intercept	40.876***	41.326 ***	41.270 ***	32.180 ***	32.473 ***	32.446 ***
R <sup>2</sup>	.090	.102	.102	.163	.169	.169
△ R <sup>2</sup>	.090	.012	.000	.163	.006	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

### ***Race, Depression and Frequency of Contact***

Table 5.5.34 displays the outcomes of OLS analyses investigating the interplay among race, depression, and frequency of contact regarding cognitive test results. Across all models, depression displayed a negative association with cognitive performance levels. Notably, a positive relationship was observed between frequency of contact with one's social network and three out of the four cognitive outcomes (with the exception of Rey-II). This suggests that individuals with more frequent social network contact tended to achieve higher cognitive functioning scores compared to those with less contact. However, the three-way interaction term (race x depression x frequency of contact) did not yield significant associations with any of the four outcomes. This suggests that frequency of contact did not moderate relationships involving race, depression and cognitive test performance.

### ***Race, Depression and Social Support***

Table 5.5.35 presents the findings from regressions investigating the interplay of race, depression, and social support and cognitive test outcomes. In Model 5.398, depression and social support emerged as significant correlates of Rey-I scores. Specifically, depression exhibited a negative association with Rey-I performance, indicating that individuals reporting more depressive symptoms attained lower cognitive scores compared to those reporting fewer symptoms. Conversely, higher levels of social support were positively associated with Rey-I scores, suggesting that individuals with greater social support achieved higher scores compared

**Table 5.5.33: Interaction Effect of Race, Depression and Network Size on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.373	Model 5.374	Model 5.375	Model 5.376	Model 5.377	Model 5.378
Race	-.410***	-.387****	-.371***	-.437***	-.420***	-.293*
Depression		-.038***	-.039***		-.039***	-.039***
Network Size		.000	-.000		.000	.000
Race X Depression			-.001			-.017
Race X Network Size			-.000			-.001
Depression X Network Size			.000			.000
Race X Depression X Network Size			.000			.000
Intercept	9.212***	9.355***	9.363***	7.914***	8.061***	8.058***
R <sup>2</sup>	.143	.150	.150	.147	.153	.153
△ R <sup>2</sup>	.143	.007	.000	.147	.006	.000
	MAT			AFT		
	Model 5.379	Model 5.380	Model 5.381	Model 5.382	Model 5.383	Model 5.384
Race	-3.298***	-3.114***	-2.930***	-2.476***	-2.403***	-2.123***
Depression		-.202***	-.217***		-.099***	-.107***
Network Size		-.001	-.003		.002**	.001
Race X Depression			-.020			-.002
Race X Network Size			.003			-.001
Depression X Network Size			.000			.000
Race X Depression X Network Size			-.001			-.001
Intercept	40.876***	41.730***	41.808***	32.180***	32.435***	32.463***
R <sup>2</sup>	.090	.100	.100	.163	.169	.169
△ R <sup>2</sup>	.090	.010	.000	.163	.007	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.  
\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Table 5.5.34: Interaction Effect of Race, Depression and Frequency of Contact on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.385	Model 5.386	Model 5.387	Model 5.388	Model 5.389	Model 5.390
Race	-.410***	-.383***	-.603	-.437***	-.417***	-.724*
Depression		-.038***	.049***		-.039***	-.057***
Frequency of Contact		.009*	.005		.005	-.001
Race X Depression			.039			.037
Race X Frequency of Contact			.012			.021
Depression X Frequency of Contact			.001			.001
Race X Depression X Frequency of Contact			-.002			-.003
Intercept	9.212***	9.192***	9.256***	7.914***	7.963***	8.072***
R <sup>2</sup>	.143	.151	.151	.147	.153	.153
Δ R <sup>2</sup>	.143	.008	.000	.147	.006	.000
	MAT			AFT		
	Model 5.391	Model 5.392	Model 5.393	Model 5.394	Model 5.395	Model 5.396
Race	-3.298***	-3.093***	-3.798***	-2.476***	-2.369***	-5.237***
Depression		-.197***	-.255***		-.098***	-.150***
Frequency of Contact		.080***	.056*		.038***	.013
Race X Depression			-.074			.110
Race X Frequency of Contact			.060			.178***
Depression X Frequency of Contact			.003			.003
Race X Depression X Frequency of Contact			.001			-.008
Intercept	40.876***	40.081***	40.495***	32.180***	31.828***	32.270***
R <sup>2</sup>	.090	.101	.101	.163	.169	.170
Δ R <sup>2</sup>	.090	.011	.000	.163	.006	.001

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

to those with lower levels of support. However, upon introducing the three-way interaction term (race x depression x social support) in Model 5.399, no significant effects on Rey-I were observed. Similar findings were observed when examining the correlates of Rey-II scores. Somewhat different results were obtained when focusing on MAT and AFT scores. In both cases, both depression and social support emerged as significantly related. Depression was negatively associated with each measure of cognitive performance, with those who reported more depressive symptoms obtaining lower scores compared to those who reported fewer depressive symptoms. In contrast, social support was positively associated with each outcome: those who received higher levels of social support obtained higher cognitive scores compared to those who reported receiving lower levels of social support. Subsequently, the three-way interaction terms (in Models 5.405 and 5.408) were also statistically significant. Evidence of this nature suggests that social support may have served to moderate the negative impact of racial disparities in depression on MAT and AFT cognitive test performance.

Figure 5.5.8 demonstrates that the negative impact of depression on MAT scores is most severe for those in racial minority groups with high levels of social support, as shown by the steepest slope in these groups. Interestingly, the increase in social support—from a low to a high level—appears to amplify the detrimental effects of depression more for racial minorities than for whites. This suggests that while social support generally serves as a beneficial resource, in the context of depression, it may inadvertently heighten the negative cognitive consequences for racial minorities. However, this pattern also implies that improvements in managing depression could significantly reduce racial cognitive disparities, particularly when both racial minorities and whites experience similar improvements in their depression levels, thereby leveraging social

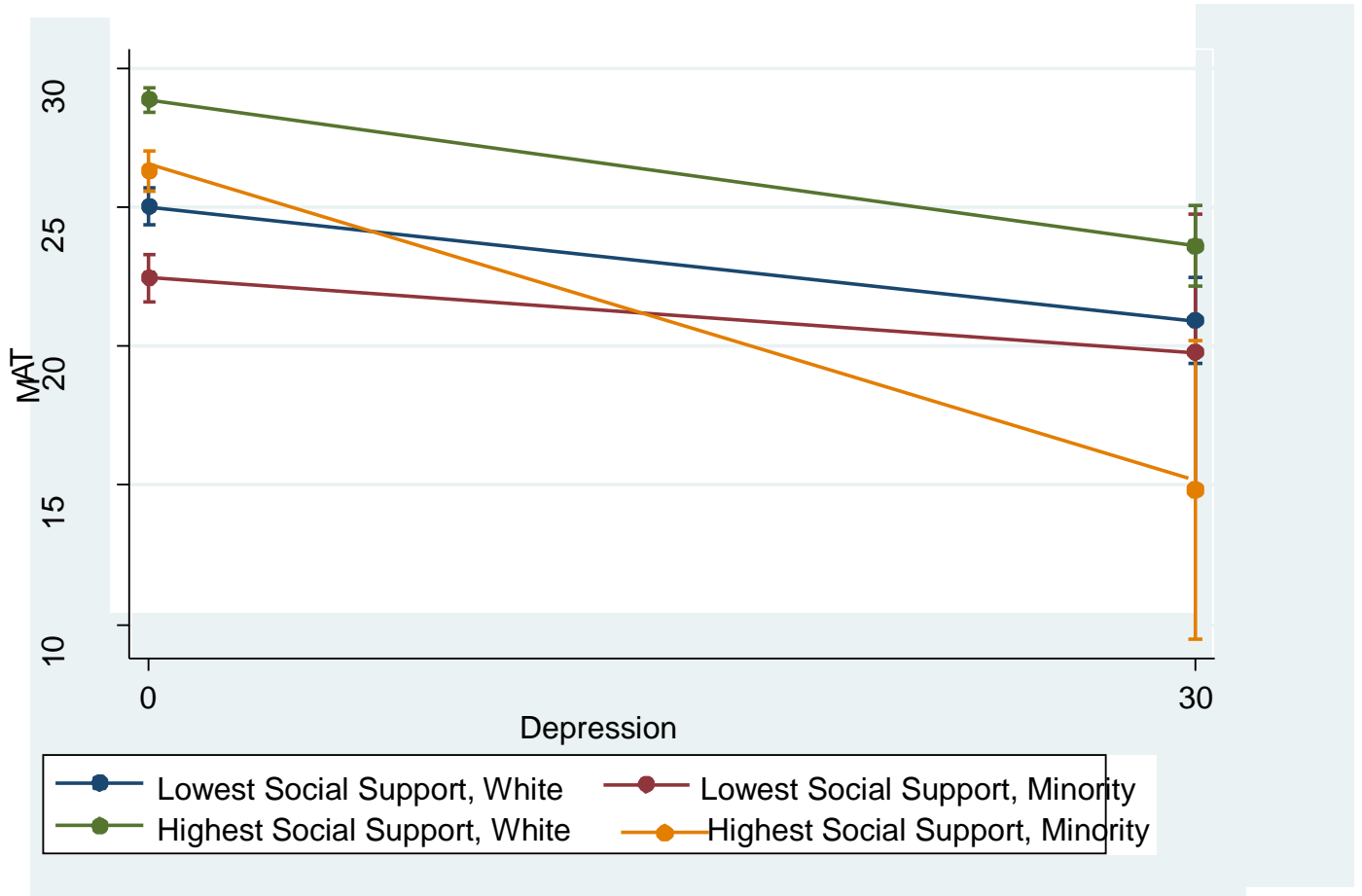
**Table 5.5.35: Interaction Effect of Race, Depression and Social Support on Cognitive Test Scores**

	Rey-I			Rey-II		
	Model 5.397	Model 5.398	Model 5.399	Model 5.400	Model 5.401	Model 5.402
Race	-.410***	-.359***	-.614**	-.437***	-.392***	-.794**
Depression		-.029***	-.017**		-.030***	-.021**
Social Support		.007***	.008***		.007***	.007***
Race X Depression			.039			.039
Race X Social Support			.004			.006
Depression X Social Support			-.000			-.000
Race X Depression X Social Support			-.001			-.001
Intercept	9.212***	8.646***	8.557***	7.914***	7.368***	7.307***
R <sup>2</sup>	.143	.154	.154	.147	.156	.156
△ R <sup>2</sup>	.143	.011	.000	.147	.009	.000
	MAT			AFT		
	Model 5.403	Model 5.404	Model 5.405	Model 5.406	Model 5.407	Model 5.408
Race	-3.298***	-3.027***	-4.351***	-2.476***	-2.324***	-4.837***
Depression		-.167***	-.159***		-.079***	-.065**
Social Support		.026***	.026***		.015***	.016***
Race X Depression			.195			.171**
Race X Social Support			.021			.033***
Depression X Social Support			-.000			-.000
Race X Depression X Social Support			-.004*			-.002**
Intercept	40.876***	39.123***	39.053***	32.180***	31.048***	31.008***
R <sup>2</sup>	.090	.102	.102	.163	.171	.171
△ R <sup>2</sup>	.090	.012	.000	.163	.008	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.  
 \*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

**Figure 5.5.8: Interaction Effect of Race, Depression and Social Support on MAT Scores**

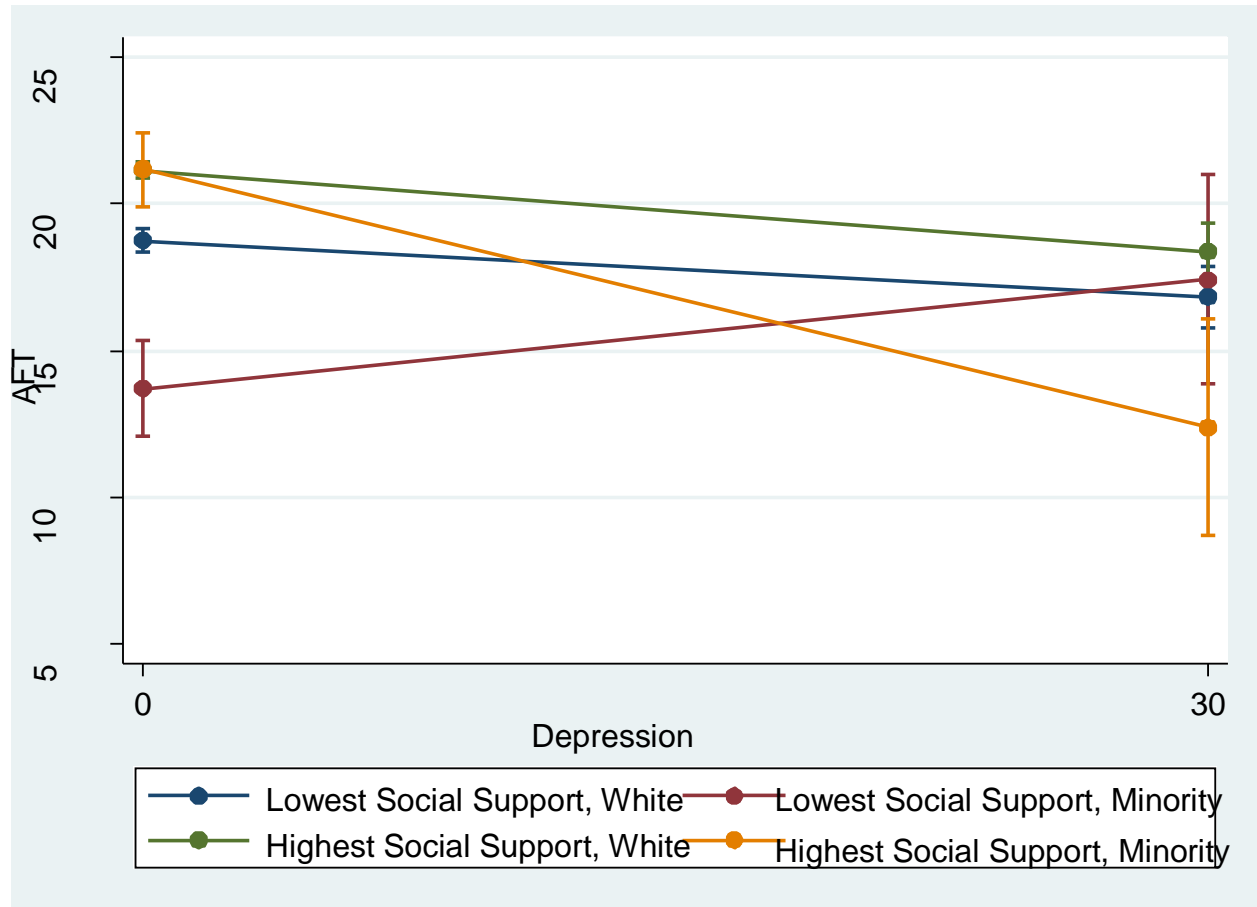


support to bridge the gap in cognitive outcomes between the groups. These findings are similar to those obtained when focusing on the AFT cognitive test (see Figure 5.5.9 ).

***Race, Depression and Social Participation***

Table 5.5.36 presents the results of regressions investigating the social dynamics of race, depression, and social participation on cognitive test outcomes. In Model 5.410, depression

**Figure 5.5.9: Interaction Effect of Race, Depression and Social Support on AFT Scores**



displayed a negative association with Rey-I scores, while social participation did not show a significant relationship. However, social participation was significantly related to each of the other three tests. Interestingly, the three-way interaction term (race x depression x social participation) proved significant in Model 5.411. Similar findings were observed for each of the other three cognitive outcomes (refer to Models 5.414, 5.417, and 5.420).

**Table 5.5.36: Interaction Effect of Race, Depression and Social Participation on Cognitive Test Scores**

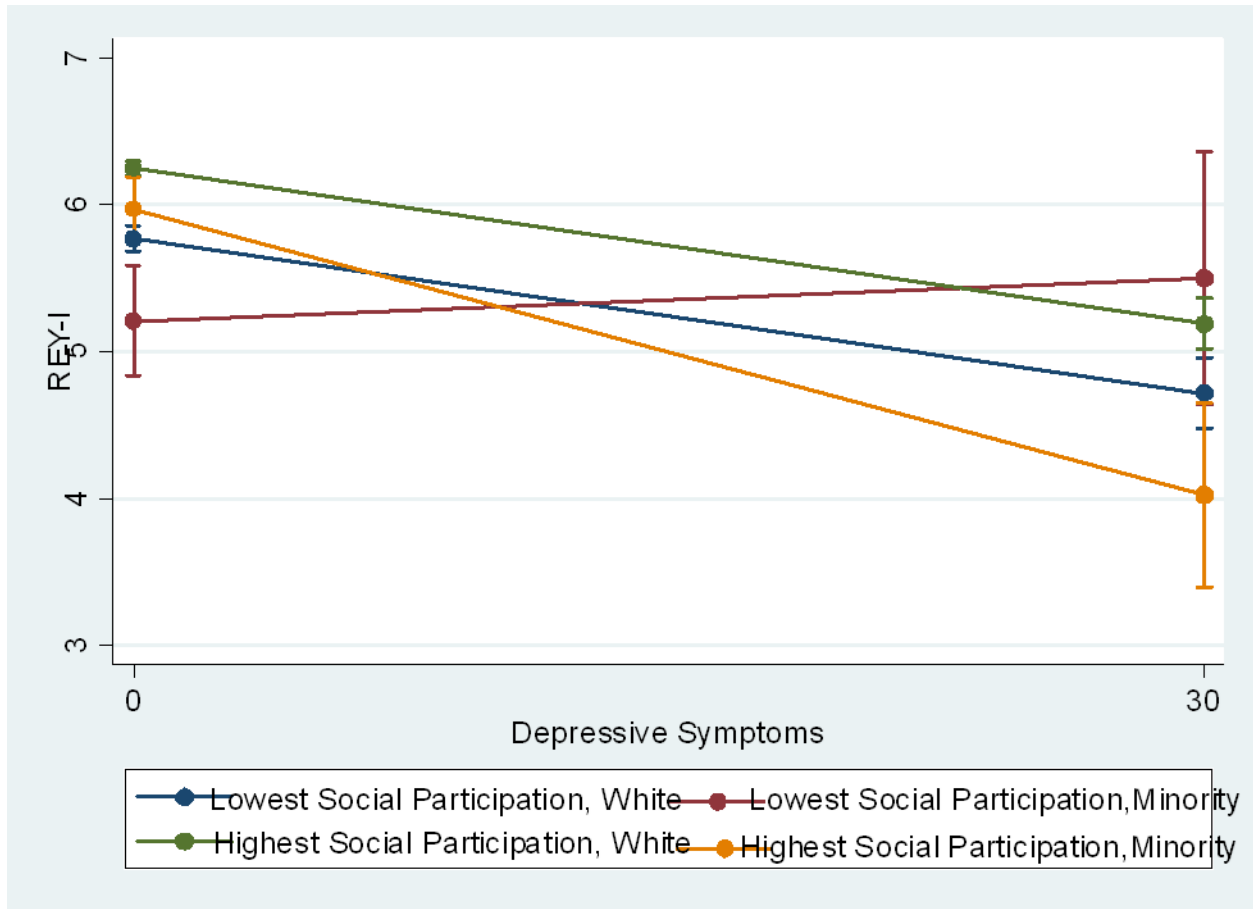
	Rey-I			Rey-II		
	Model 5.409	Model 5.410	Model 5.411	Model 5.412	Model 5.413	Model 5.414
Race	-.410***	-.389***	-.649**	-.437***	-.420***	-.543
Depression		-.035***	-.035***		-.037***	-.039***
Social Participation		.156	.161***		.143***	.144***
Race X Depression			.068**			.076**
Race X Social Participation			.092			.067
Depression X Social Participation			-.000			.001
Race X Depression X Social Participation			-.025**			-.031**
Intercept	9.212***	8.910 ***	8.892 ***	7.914 ***	7.655 ***	7.648 ***
R <sup>2</sup>	.143	.153	.153	.147	.155	.155
△ R <sup>2</sup>	.143	.010	.000	.147	.008	.000
	MAT			AFT		
	Model 5.415	Model 5.416	Model 5.417	Model 5.418	Model 5.419	Model 5.420
Race	-3.298***	-3.129***	-3.509***	-2.476***	-2.385***	-2.288***
Depression		-.191***	-.235***		-.094***	-.116***
Social Participation		.544***	.463***		.344***	.312***
Race X Depression			.207			.127
Race X Social Participation			.267			.043
Depression X Social Participation			.017			.008
Race X Depression X Social Participation			-.096*			-.057*
Intercept	40.876***	40.095 ***	40.311 ***	32.180 ***	31.578 ***	31.663 ***
R <sup>2</sup>	.090	.102	.102	.163	.170	.170
△ R <sup>2</sup>	.090	.012	.000	.163	.007	.000

Note: Analyses controlled for gender, immigrant status, age, rural/urban residence, religion, language, chronic illness, and cohort.

\*p < .05. \*\*p < .01. \*\*\*p < .001 (two-tailed test).

Source: Canadian Longitudinal Study on Aging Baseline Data

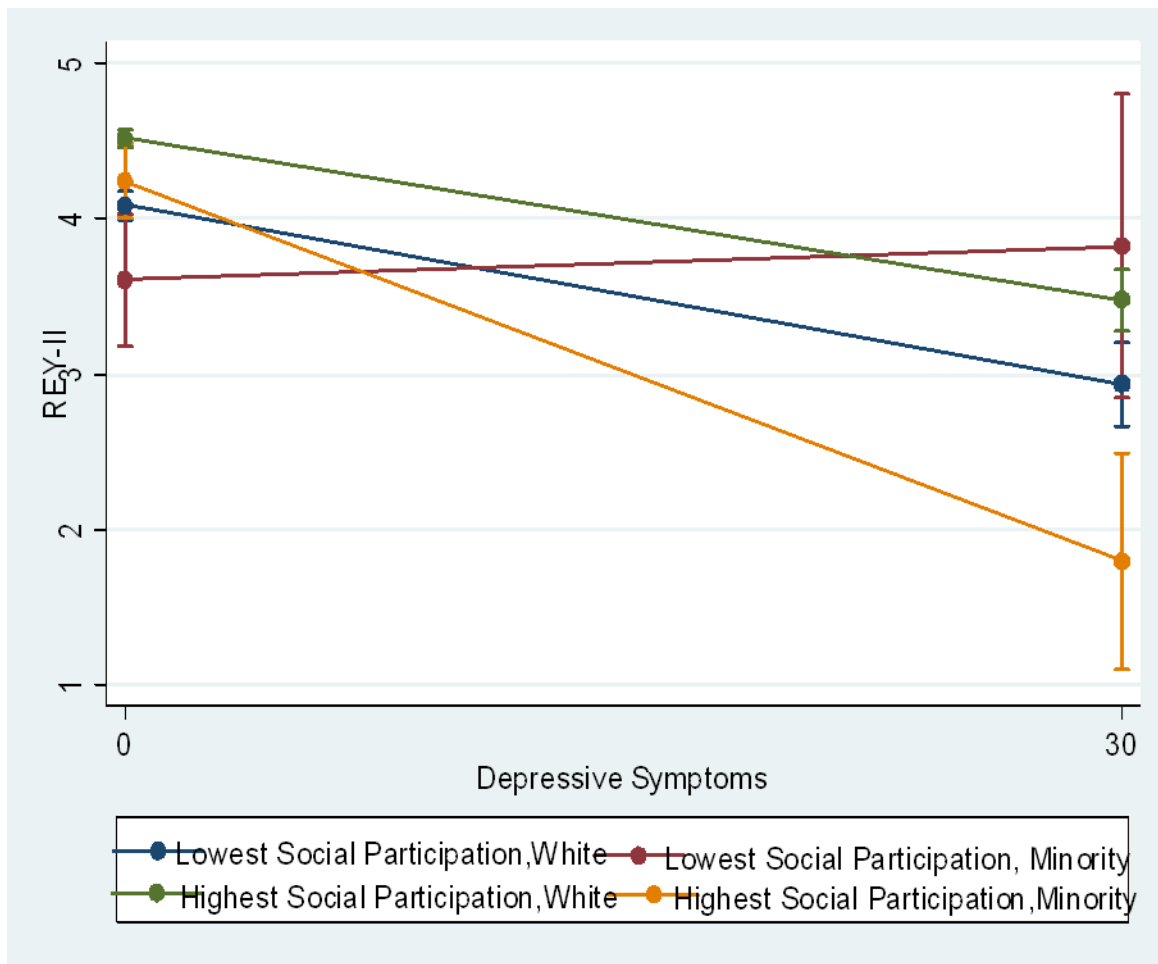
**Figure 5.5.10: Interaction Effect of Race, Depression and Social Participation on Rey-I Scores**



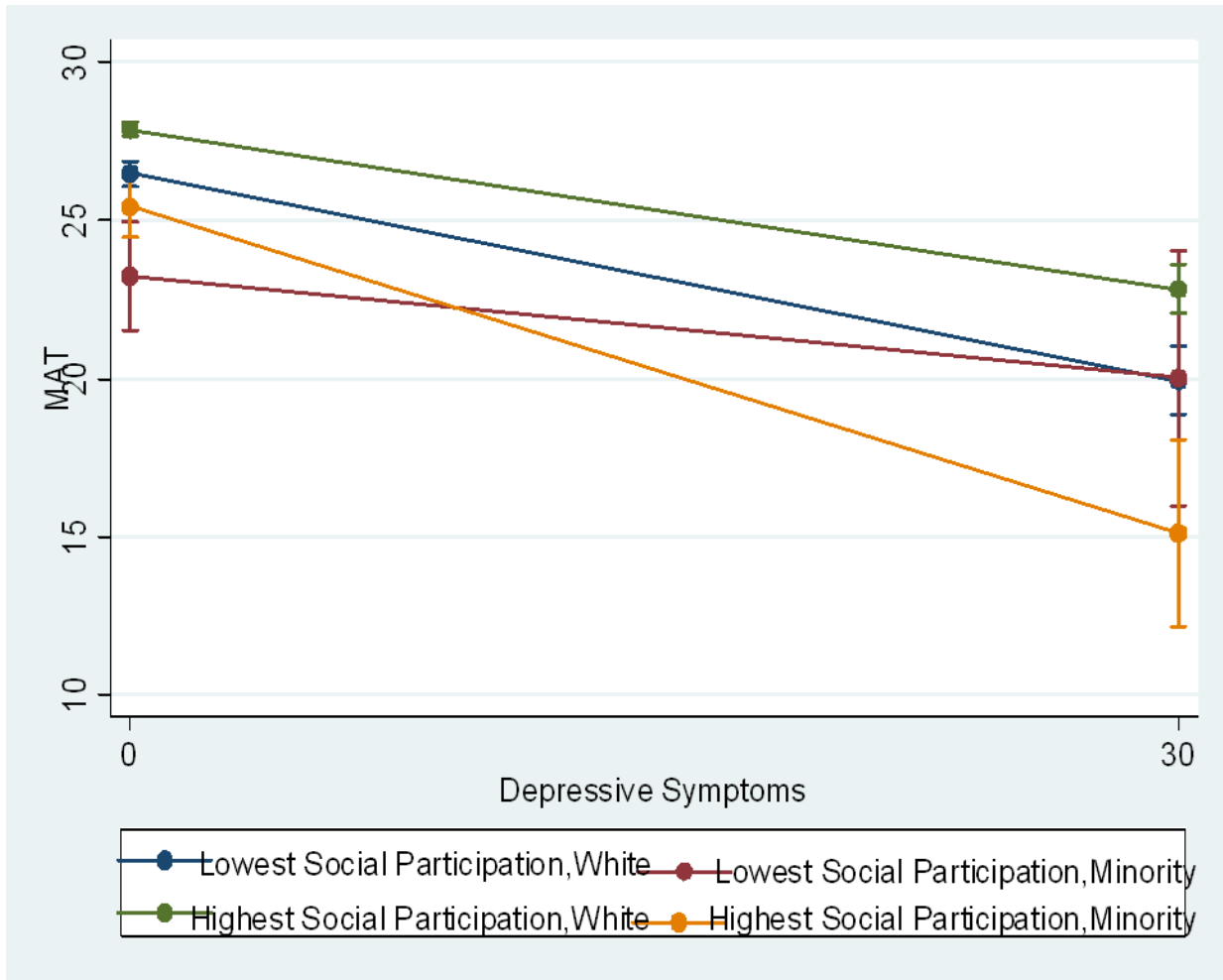
Post-estimation analyses illuminate these interaction effects. Figure 5.5.10 shows that the negative impact of depression on Rey-I scores is most pronounced for racial minority groups with high levels of social participation, indicated by the steepest slope among these groups. Furthermore, the data indicate that an increase in social participation—from low to high levels—exacerbates the adverse effects of depression more substantially for racial minorities than for whites. This suggests that while social participation is generally viewed as beneficial, in the

context of depression, it may intensify the cognitive drawbacks more for minorities. Despite this, the pattern also implies that improvements in depression treatment could significantly lessen racial cognitive disparities, particularly when both racial minorities and whites experience similar reductions in depression, using social participation as a lever to equalize cognitive outcomes between the groups. These findings are similar with regard to the Rey-II, MAT and AFT tests (see Figures 5.5.11, 5.5.12 and 5.5.13 below).

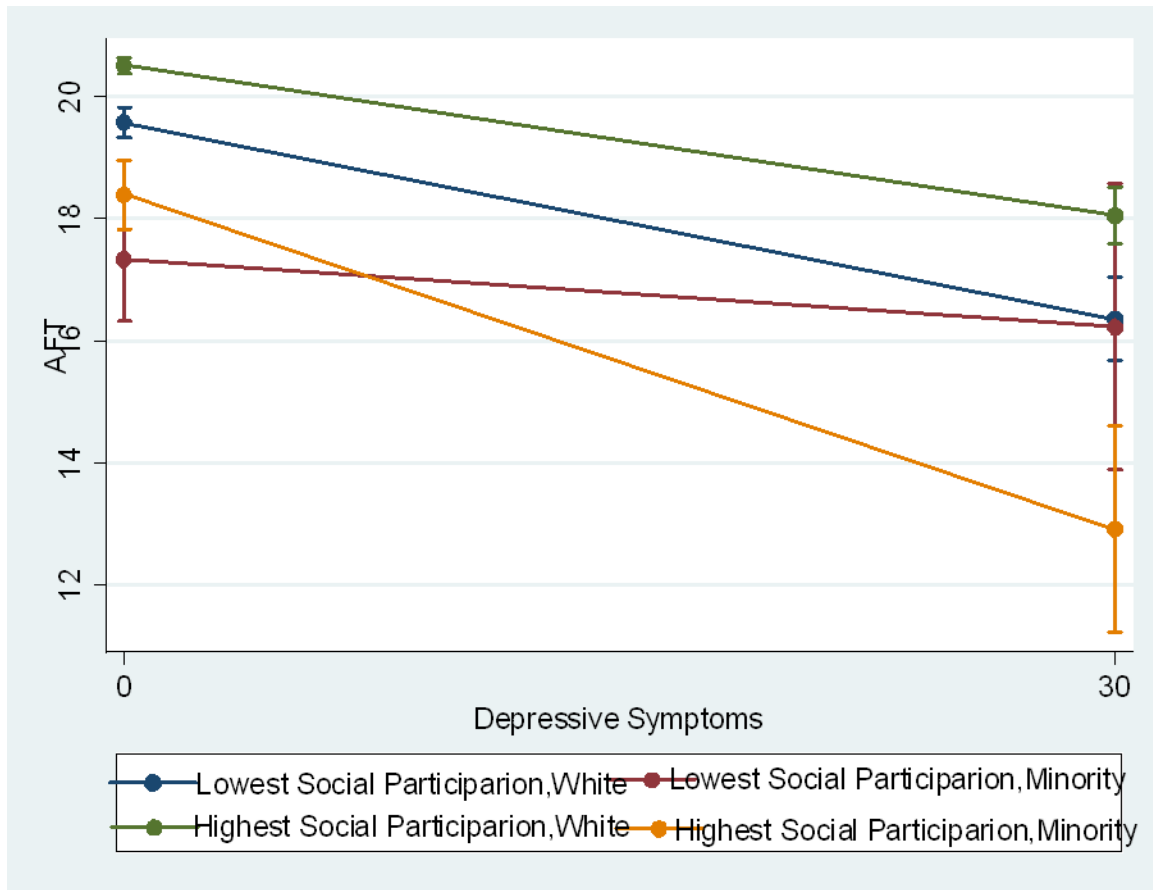
**Figure 5.5.11: Interaction Effect of Race, Depression and Social Participation on Rey-II Scores**



**Figure 5.5.12: Interaction Effect of Race, Depression and Social Participation on MAT Scores**



**Figure 5.5.13: Interaction Effect of Race, Depression and Social Participation on AFT Scores**



In summary, the results of analyses examining the moderating effects of social resources on racial disparities in the impact of secondary stressors on cognitive functioning revealed little evidence to support the moderating effects of social resources with regard to racial disparities in the impact of either SRH or life satisfaction. Conversely, social resources did appear to moderate relationships involving race and both SRMH and depression with cognitive functioning. In particular, although marital status, network size, and frequency of contact did not show

significant interaction effects with regard to any of the four outcome measures, social support had a moderating effect on the impact of racial disparities in SRMH for one cognitive test (AFT) as well as on the impact of racial disparities in depression for two cognitive tests (MAT and AFT). In addition, social participation had a moderating effect on the impact of racial disparities in depression for all four cognitive tests.

## **5.6 Summary**

This chapter has reported the results of analyses investigating the interplay between race, other social structural factors, exposure to primary and secondary stressors, social resources and cognitive functioning. Overall, the findings revealed a significant association between race and cognitive functioning. Racial minority participants consistently exhibited lower cognitive performance across all tests when grouped together as a single category and compared to their white counterparts. However, the distinctions became less definitive when examining specific racial minority groups, as certain groups displayed statistically significant disparities in cognitive performance compared to whites whereas others did not. Additionally, analyses examining the interaction of race (white vs non-white) with other social structural factors, including gender and immigrant status, in influencing cognitive functioning, revealed nuanced patterns.

The study also examined racial disparities in exposure to various stressors used to explain cognitive performance gaps. Racial minorities experienced lower household income and homeownership rates compared to whites, although their average education levels were higher. Furthermore, racial minorities reported lower subjective ratings of health, mental health, and life satisfaction, along with higher levels of depression compared to whites. Interestingly, all of the

stressors, except lower education, exhibited statistically significant mediating effects on relationships between race and cognitive performance. Finally, social resources like marital status, social support, and social participation were found to moderate the effect of stressors (e.g., lower education, lower household income, non-homeownership and lower SRMH) more in racial minorities compared to whites, suggesting that social engagement and support are key to mitigating racial disparities in cognitive functioning. Interestingly, the same social resources appear to intensify the negative effects of stressors such as depression among racial minorities more than among whites, which actually indicates that social resources strengthen the positive effects of reduced depression more among racial minorities. Overall, according to the findings here, some social resources amplify the positive effects of socioeconomic protective factors (i.e., reduced primary stressors) and good subjective well-being (i.e., reduced secondary stressors) more for racial minorities than for whites. This dual effect highlights the complex interplay between social resources and stressors within different racial groups.

The following chapter reviews these findings in the context of existing literature and the research questions and hypotheses assessed in this study. It also outlines the limitations of this study as well as the theoretical, research, and policy implications of the results.

# CHAPTER SIX

## DISCUSSION AND CONCLUSIONS

Despite growing acknowledgment of racial disparities in cognitive functioning, the nature of these disparities and their underlying mechanisms remain unclear, particularly in the Canadian context. To address these gaps, this study drew on Pearlin's Stress Process Model, a theoretical framework that addresses the connection between social status, including racial minority status, and health outcomes through differential exposure to stressors and access to social resources. The SPM was modified for use in this study by incorporating an intersectionality framework and using the model to focus on cognitive functioning as a health outcome. Overall, four research questions and four hypotheses were addressed. The findings yield several theoretically and empirically significant insights, carrying implications for future research and policy and practice considerations. These are discussed in the current chapter.

### **6.1 Research question 1: “Are there racial disparities in cognitive functioning in middle and later life?”**

This study aimed to understand the relationship between racial minority status and cognitive functioning among middle-aged and older adults in Canada. Based on existing literature, the following hypothesis was tested: *People belonging to racial minority groups are likely to demonstrate lower cognitive functioning during middle and later life compared to their non-minority counterparts.* Overall, the results of the bivariate as well as multivariate

analyses revealed that when racial minority group members were compared as a single (homogeneous) group to whites, performance on the four cognitive tests (Rey-I, Rey-II, MAT and AFT) differed. People classified as belonging to a racial minority performed more poorly on both memory domains (Rey-I and Rey-II) as well as on executive functioning (MAT and AFT) compared to whites.

These findings are consistent with the SPM insofar as it suggests a relationship between race and other social structural locations, and health outcomes. They also align with previous findings, including those by Chen et al. (2022), Díaz-Venegas et al. (2019), Sisco et al. (2015) and Zhang et al. (2016), all of which were conducted in the US and report evidence of lower cognitive functioning in racial minority middle-aged and/or older adults compared to whites. However, although these studies addressed racial disparities in cognitive functioning, they generally focused on comparisons of blacks and whites and/or blacks, Hispanics and whites. There has been a notable lack of attention directed towards other racial groups such as Chinese, South Asians, Japanese and Arabs, several of which tend to be relatively prevalent in the US as well as Canadian contexts.

However, the findings of this study also resonate with previous research conducted in the Canadian context. For instance, Haq and Penning's (2019) study also compared white vs non-white disparities in cognitive functioning and observed that members of racial minority groups exhibited lower cognitive functioning in Canada among individuals aged 60 and above compared to whites. However, the current study suggests that this is evident not only when focusing on older adults but also, on individuals in middle age. Additionally, our study aligns with another Canadian study by Stinchcombe and Hammond (2022), which also used the CLSA dataset and

found racial disparities in cognitive functioning, including the lower performance of non-white than white individuals on memory and executive function cognitive tests.

Overall, therefore, this study confirms that there are racial disparities in cognitive functioning when comparing whites and non-white groups, that this encompasses both memory and executive functioning domains, and that the disparities extend beyond a focus solely on blacks, Hispanics, and whites. Furthermore, unlike previous studies which tend not to compare cognitive functioning levels across specific racial groups (such as South Asians, Chinese, Japanese, and others), within the limits of the data, this study compared several specific racial groups with regard to cognitive functioning in middle and later life. This comparison revealed findings indicating that blacks, South East Asians, Latin Americans and Chinese performed poorly on all measures and Filipinos, Koreans, South Asians, Japanese, Arabs, West Asians performed poorly on at least one measure compared to whites. Conversely, other minority groups such as Filipinos, Koreans, South Asians, Japanese, Arabs, West Asians, and individuals of mixed races, showed notable differences in performance across some (either two or three) but not all of the tests. For example, West Asians did not differ from whites on either of the two memory tests (Rey-I and Rey-II) but performed more poorly than whites on both measures of executive functioning (MAT, AFT). Other groups performed more poorly on a combination of measures within each domain. To some extent, these findings align with the prior research findings of Lim et al. (2021) and Mayeda et al. (2016) in the US as well as Pham and colleagues (2018) in the UK, who observed that dementia was most prevalent in African-American groups, least prevalent among Asian-Americans, and fell in an intermediate range among Latinos.

Finally, it is notable that individuals representing other racial minorities (i.e., Koreans and Japanese) differed from whites on only on one of these measures. Exactly what accounts for

these disparities is unclear. On the one hand, the findings could be reflecting differences in levels of education, access to social and material resources as well as differences in exposure to discrimination and/or neighborhood segregation (Chen et al., 2022; Meyer et al., 2017; Park et al., 2024; Weauve et al., 2018). This, in turn, could have differential implications for different domains of cognitive functioning (e.g., memory vs executive functioning). The explanation could also be methodological, at least in part. For example, the racial minority groups represented in this study tended to be relatively small in size (ranging from about approximately 100 to 1,000 respondents). There are also indications of racial bias in assessments of cognitive functioning, the nature and extent of which may differ across different racial (cultural and ethnic) groups (Dotson and Duarte, 2020). Given these limitations, it is important to emphasize the inability to draw firm conclusions and generalize the findings derived from these results across all racial groups within the broader population. Overall, there is a clear need for further research to be conducted, focusing on multiple measures of cognitive functioning, within racially diverse samples.

In summary, in the Canadian context, there has been a notable absence of research examining variations across various domains of cognitive functioning among racial minority groups during middle and later life. This study addressed this knowledge gap by investigating racial disparities in cognitive functioning in Canada, providing an original exploration into this issue. The findings both support hypotheses based on prior research (i.e., research suggesting that racial minorities often demonstrate poorer cognitive functioning in middle and later life compared to their non-minority counterparts) and also offer some directions for further research designed to enhance our understanding of racial disparities in cognitive functioning (to be

discussed in subsection 6.7). This will have important implications for policy and practice directed at addressing age-related cognitive impairments (see subsection 6.8).

## **6.2 Research question 2: “Do racial disparities intersect with other social structural locations (e.g., gender, immigrant status) to influence cognitive functioning in middle and later life?”**

This study also examined the interaction effects of race by gender and race by immigrant status on cognitive function. The findings provide some support for hypothesis 2: *Racial minority status will intersect with other social structural locations (e.g., gender, immigrant status) to influence cognitive functioning in middle and later life*. For three of the four cognitive outcome measures (i.e., Rey-I, MAT and AFT), the findings indicated that race (white vs non-white) and gender primarily had an additive rather than an interactive effect on cognitive functioning. However, there was an interaction effect involving race and gender on Rey-II cognitive test scores, with the difference in scores between men and women being somewhat more pronounced among whites than among minorities. Specifically, white females outperformed all the other groups followed in order by racial minority females, white males and finally, racial minority males.

This finding aligns with a significant number of studies on cognitive health (e.g., Aartsen et al., 2004; Sundermann et al., 2016) that have found women perform better on verbal memory tests compared to men. This advantage continues even when memory problems start to appear, as in a condition called amnesic mild cognitive impairment (aMCI). Researchers report finding that despite brain changes in aMCI, women still perform better on memory tests than men. However,

when it comes to Alzheimer's disease dementia, this advantage disappears. This suggests that women may experience faster decline from aMCI to AD dementia compared to men (Sundermann et al., 2017). Therefore, these authors argue that verbal memory tests like RAVLT should be sex adjusted.

The results also align with those reported by Avila et al. (2019), who demonstrated that although older men initially outperformed older women on cognitive tests, the dynamics changed when performance was analyzed across genders by race. Their study revealed the largest difference was between white men and Hispanic women on visuospatial and language skills and between white women and black men on memory, which supports the results of the present study. Similarly, in a later longitudinal study of older adults, Avila et al. (2020) found that the difference in cognitive functioning between white men and women was larger than the difference between non-white men and women (Hispanics and blacks) in memory, language, and visuospatial functioning domains at baseline, which aligns with the findings of the current study too. They found that verbal memory scores were initially highest in white women, followed by white men, outscoring black and Hispanic men and women. However, black women showed a faster decline in memory compared to white women, while the rate of language decline was similar across sex/gender by racial/ethnic groups. Their findings support the cognitive reserve theory<sup>7</sup> to some extent (Sundermann et al., 2017), suggesting that women consistently perform better in verbal memory tests at baseline but experience faster cognitive decline over time. The finding that verbal memory scores were initially highest in white women is consistent with our findings, but contradicts the observation that racial minority males exhibited the poorest

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<sup>7</sup> “Cognitive reserve, broadly conceived, encompasses aspects of brain structure and function that optimize individual performance in the presence of injury or pathology” (Jones et al., 2011, p. 593).

cognitive performance. One explanation for the difference in results might be that Avila and colleagues only included black and Hispanics in their study while we included other racial minority groups (such as South Asians, East Asians, Chinese, Japanese, Arabs, and more) as well as blacks and Hispanics in a single category.

The findings of this study also revealed a significant interaction effect between race and immigrant status, indicating that the effect of immigrant status was more pronounced among members of racial minority groups than among whites, at least on two of the four cognitive tests (i.e., the MAT and the AFT). Specifically, our study demonstrated that immigrants exhibited better or similar cognitive functioning compared to non-immigrants but only among whites. Therefore, the findings support the concept of a ‘Healthy Immigrant Effect’ for whites but not for non-whites. Among non-whites, in contrast, non-immigrants performed better than immigrants. It might be that the interaction effect is only evident in the executive functioning domain and not in the memory domain. One explanation could be that bilingualism among immigrants may enhance performance in executive functioning tests, as demonstrated in Padilla et al.'s (2016) study of Mexican-American immigrants, where bilinguals outperformed monolinguals in executive tasks but not in memory tasks. Meyer et al. (2023) found that first generation immigrants performed worse in all domains of cognitive functioning (e.g., episodic memory, executive functioning) compared to second and third generation immigrants. They found a significant race by immigrant status interaction effect in the semantic memory domain among first generation immigrants, but not in the episodic memory and executive functioning domains.

The findings of our study align with those of Kobayashi and Prus (2012) in the Canadian context, demonstrating that the ‘Healthy Immigrant Effect’ is contingent on racial status.

Specifically, the health of non-white immigrants was also found to exhibit more variability compared to white immigrants in their study. The findings are also consistent with other studies (e.g., Adjel et al., 2020 in the US and Lamson, 2023 in the Canadian context), demonstrating how immigrants' health outcomes differ based on race (white/non-white). Future research should replicate our findings, using several different tests in the executive functioning domain, to determine whether the observed effects are specific to immigration status.

### **6.3 Research question 3: Do differences in exposure to stressors (primary and secondary) mediate the relationship between racial minority status and cognitive functioning in middle and later life?**

This study also aimed to elucidate the mediating role of both primary stressors (such as lower education, reduced household income, and non-homeownership) and secondary stressors (including self-rated poor physical and mental health, lower life satisfaction, and depression) on the connection between racial minority status and cognitive functioning. In general, the findings support *Hypothesis 3: Associations between racial minority status and cognitive functioning will be mediated by differences in exposure to stressors (primary, secondary).*

Regarding primary stressors, education, income, and homeownership are all commonly regarded as indicators of socioeconomic status. While some studies (e.g., Martikainen, Blomgren, and Valkonen, 2007) incorporate all three indicators into one latent construct within a single model, it is important to note that they are correlated, overlapping, but not identical, and each may have independent effects (Darin-Mattsson et al., 2017). For instance, in a study examining the health outcomes of older adults, Geyer et al. (2006) found that SES indicators

such as education, occupation, and income were distinct and could not be used interchangeably. Similarly, in a study investigating the impact of stratification on mortality, Torssander and Erikson (2009) identified independent effects of each SES indicator and cautioned against combining them into a latent construct due to potential loss of information.

In the present study, given the conceptual differences and unique influences of education, income, and homeownership on cognitive functioning as well as their relatively weak correlations with one another ( $r=0.30$  between education and income;  $r=0.30$  between income and homeownership; and  $r= 0.12$  between education and homeownership), it was considered important to examine their independent mediating effects. This approach allows for a more nuanced understanding of how each SES indicator may contribute to racial disparities in cognitive functioning. For example, our findings revealed that although education did not serve as a mediator in the relationship between racial minority status and any of the cognitive functioning measures, both household income and homeownership mediated relationships between race and cognitive functioning among middle-aged and older adults in Canada. Household income, along with the control variables, was found to explain 7.3% to 15.1% of the variance in cognitive functioning scores associated with race, while homeownership, along with the control variables, was found to account for 2.5% to 6.3% of the variance in scores. Thus, both suggest partial mediation.

A review of the literature is consistent in pointing to a positive association between education and cognitive functioning (e.g., Alley, Suthers, and Crimmins, 2007; Cagney and Lauderdale, 2002; Deary et al., 2009; Stinchcombe and Hammond, 2022). However, our findings provide little evidence that education served as a mediator of relationships between race and cognitive functioning. This contrasts with earlier research by Díaz-Venegas et al. (2015), Farina

et al. (2020), Koster et al. (2006), Yaffe et al. (2013), and Zahodne et al. (2017) in the US context, each of which identified education as a mechanism contributing to black-white differences in cognitive functioning. Further, Sherman-Wilkins and Thierry (2019) found that not only black but also, Mexican American older adults were more likely to have cognitive impairment than whites, but education mediated the difference between whites and Mexican Americans.

The discrepancy in findings could be attributed to the fact that previous studies, which regarded education as a risk factor, did not compare all racial groups collectively to whites. Instead, they compared specific racial groups. Yet, not all racial minority groups have lower educational attainment compared to whites, suggesting that differences in education level may not fully explain the racial disparity in cognitive functioning in later life evident when comparing whites to non-whites. For instance, Mayeda et al. (2017) observed that average education levels were lower among Asian-Americans compared to whites. However, dementia rates were also lower among Asian Americans compared to whites. On the other hand, Filipino Americans exhibited the highest levels of education, yet also had the highest prevalence of dementia compared to whites and other Asian subgroups. This also suggests that education may not be the only mechanism at play. For example, some studies suggest that the quality of education may also explain racial differences in cognitive impairment. For example, Yaffe et al. (2013) found that the black-white differences in cognitive impairment among older adults were explained by differences in the quality of education they were exposed to. Furthermore, the benefits associated with education may vary among different racial groups, potentially influenced by factors such as access to social resources and racial discrimination in employment opportunities, which can affect the advantages provided by similar levels of education.

Conversely, our findings demonstrating that household income served to mediate the link between racial minority status and cognitive functioning are consistent with previous research in the USA (Cagney and Lauderdale, 2002; Mehta et al., 2004; Schwartz et al., 2004; Yaffe et al., 2013). In a study of older adults from three different racial groups (blacks, whites and Hispanics), Zahodne (2017) found income mediated the relationship between race and cognitive health. The observations concerning income also align with the results of a Canadian study by Haq and Penning (2019), demonstrating that income differences partially account for cognitive functioning disparities between white and non-white individuals.

To date, there is no existing research examining homeownership as a mediator between racial minority status and cognitive functioning in the Canadian context. Nevertheless, our results regarding homeownership align with the work of Gleib, Lee, and Weinstein (2022) in the US, which suggests that the possession of wealth, including a home, can account for disparities in cognitive functioning between black and white individuals. Homeownership serves as a key indicator of access to resources, with racial disparities in this asset reflecting broader socioeconomic inequalities. Given its role in intergenerational wealth transfers, persistent racial disparities in homeownership even in the presence of educational attainment, underscore ongoing inequalities in family inheritance and access to this critical asset (Kuebler, 2013). Therefore, it can be argued that relying on educational attainment may not adequately explain racial disparities in socioeconomic status and subsequent health, including cognitive health, outcomes. Despite achieving higher levels of education, racial minorities may still face persistent disparities in income and access to assets like homeownership, resulting in chronic stress that impacts cognitive health.

Regarding secondary stressors, the current study confirmed the mediating effects of all four measures (i.e., self-rated health, self-rated mental health, life satisfaction, and depression) on the relationship between racial minority status and all four cognitive functioning outcomes. Racial minorities reported greater psychological strain (including poorer SRH, SRMH, life satisfaction and depression) than whites and this, in turn, served as a mechanism linking race to cognitive functioning. This exploratory study stands out as no previous studies, either in the US or Canada, specifically delved into the mediating role of self-rated health, self-rated mental health, life satisfaction, and depressive symptoms on the link between racial minority status and cognitive functioning. Nevertheless, associations between each of these stressors (considered separately) and cognitive functioning have been established in previous research (Aschwanden et al., 2020; Barnes et al., 2006; Bendayan et al., 2017; Goda et al., 2020; Jang et al., 2020; Peitsch et al., 2016). Racial disparities in these stressors have also been found (Bell et al., 2018; Jimenez et al., 2022; Knies et al., 2016; Santos-Lozada, 2016). This study contributes to the literature by conceptualizing these factors within Pearlin's (1989) Stress Process Model and exploring their potential mediating role in the relationship between race and cognitive functioning. The theoretical implications are discussed in greater detail in subsection 6.6.

#### **6.4 Do social resources moderate the impact of stressors (primary and secondary) on racial disparities in cognitive functioning in middle and later life?**

This study also aimed to discuss the moderating roles of social resources (including marital status, social network size, frequency of contact, social support, and social participation)

on the relationship between race, stressors and cognitive functioning. The findings provided some support for *Hypothesis 4: Associations between race, stressors (primary and secondary) and cognitive functioning will be moderated by the level of social resources available.*

Specifically, they revealed that marital status, social support, and social participation moderated the effect of primary stressors (i.e., household income and non-homeownership) on various cognitive tests differently between whites and racial minorities. The moderation effect was more pronounced among racial minorities than among whites. Additionally, social support and social participation were found to moderate the relationship between two secondary stressors (i.e., SRMH and depression) and specific cognitive tests differently between whites and racial minorities, and the moderation effect was again more salient among racial minorities. However, higher social resource levels did not benefit those with depressive symptoms, as their scores on cognitive tests were lower than those of individuals without depression and with lower social participation. Nevertheless, the study indicated that when depression was reduced and social participation was high, cognitive scores improved significantly, with the increase being more pronounced for racial minorities than for whites.

The findings regarding the positive effect of social resources partially align with studies indicating that social resources moderate the adverse effects of stressors like lower SES indicators (e.g., education, income, and wealth) and depression on health outcomes and well-being. For instance, Lee and Choi (2020) observed that marital status moderated the impact of lower SES on life satisfaction. Similarly, Zhou (2021) found that social support moderated lower SES effects on health while Adams et al. (2015) found that social support moderated the negative effect of depression on life satisfaction. Furthermore, our findings partially support the results of Sheffler and Sachs-Ericsson (2016) who found that the association between stress and chronic

physical health conditions (e.g., hypertension, cardiovascular diseases) in African-Americans was moderated by perceived social support at any stress level, whereas in whites, moderation was evident only at lower stress levels. Further, Krause (2006) and Pressman et al. (2009) reported that social participation served to moderate the negative effects of lower SES on health among older adults.

The findings are also consistent with studies such as those by Zuelsdorff et al. (2013, 2017), which highlighted how social resources serve to moderate the impact of lower SES on cognitive decline. However, findings indicating that social resources moderated the negative effect of primary and secondary stressors on cognitive functioning in racial minority middle-aged and older adults more than their white counterparts is a novel finding in this field. Nevertheless, these findings appear consistent with studies examining the differential effects of social support on the mental health of blacks and whites. For example, Krause (2006) found that both religious and secular social support moderated the relationship between stress and SRH more in older blacks than in older whites. Similarly, Assari and Lankarani (2018) in a study on older adults found that religious and secular emotional social support moderated the relationship between stress and depressive symptoms more in blacks than in whites.

As the current study is the first to focus on the moderating effect of various social resources on the relationship between stress and cognitive health, it has significant implications for both research and policy. It suggests that policy recommendations aimed at increasing awareness about the importance of enhancing certain social resources may effectively reduce racial differences in cognitive functioning in later life. Further, increasing the effectiveness of existing policies that focus on providing social support can also reduce racial disparities in cognitive functioning among older adults (as discussed in detail in subsection 6.7).

## 6.5 Study Limitations

This study is subject to several limitations. First, it used cross-sectional data, preventing the observation of longitudinal changes in the mediating effects of stressors and moderating effects of social resources on cognitive health over time. Similarly, the cumulative impact of stressors over time could not be assessed. A longitudinal approach would provide more robust insights into cognitive decline among middle-aged and older adults. Moreover, while certain social resources appeared to worsen depressive symptoms rather than moderate them, it is important to consider reverse causality as a potential explanation. For example, if social support is provided based on a person's needs, those with higher levels of depression might get more support from friends and family. So, social support and depression might affect each other in both directions. However, we were unable to test this hypothesis due to the cross-sectional nature of our data. Therefore, future research should aim to establish relationships by incorporating follow-up data from the CLSA dataset and conducting longitudinal analyses.

Secondly, with regard to sampling, those with cognitive impairment at the time of the baseline survey were systematically excluded from the study sample. Also, since the study sample was limited to those who were living independently in the community (i.e., not in institutional settings), those with more than very mild levels of cognitive impairment were the least likely to be represented in the study sample. Furthermore, in terms of race, the CLSA excluded Indigenous people living on reserves in the three territories and some remote areas, which limited our ability to understand the disparities experienced by Indigenous populations in cognitive functioning during middle and later life in Canada. As well, we were unable to identify

those indigenous adults who were living in urban areas. The study's representation of other racial minority groups was also limited, with those identified as non-white comprising only 5% of the total sample. This insufficient representation hindered the ability to evaluate the stress process and draw generalized conclusions across various racial groups. Consequently, the study had to simplify most of the analyses by creating a binary variable for race, categorizing participants into either "white" or "racial minority" groups. Despite Canada's diverse population, the limited number of racial minority group members within the CLSA dataset constitutes a notable weakness.

Several measurement limitations should also be noted. CLSA data collection was conducted exclusively in English or French, overlooking the linguistic diversity present in Canada where individuals may speak languages other than English or French as their second or even third language. This language bias could have influenced cognitive assessments, as tasks such as naming animals in English/French within a limited time frame or recalling previously presented words may have disadvantaged participants whose primary language differs. To mitigate this issue, future data collection efforts regarding cognitive functioning should prioritize linguistic inclusivity by ensuring the availability of translators or translated materials.

Also, with regard to measurement, several studies (Burke et al., 2019; Hood et al., 2022) emphasize the importance of accounting for language and racial factors when designing and applying cognitive assessment tools. Gasquoine (2009) argued that race-norms are essential because discrepancies in neuropsychological test scores between African and White Americans can reflect demographic variables like education, age, and socioeconomic status, rather than genuine cognitive deficits. For example, African-Americans are usually found to score low compared to whites on most neuropsychological assessment tests. However, the RAVLT shows

mixed validity across racial groups as community-based studies report African Americans scoring .64 standard deviations below white Americans (Schwartz et al., 2004), while Boone et al. (2007) found no significant differences in RAVLT scores between the two groups. In a recent study on differences in performance validity test scores, Hood et al. (2022) found that the differences in RAVLT scores between African-Americans and whites did not differ, which makes it a valid tool to use for assessing cognitive abilities. Further, Strutt et al. (2015) argued that several English neuropsychological tests have been translated and culturally adapted for Spanish-speaking adults, with the RAVLT being a notable example. Another study of Burke et al. (2019) found that while many neuropsychological instruments lacked sensitivity and specificity data for Spanish speakers, the Rey Auditory Verbal Learning Test (RAVLT) performed better among Spanish speakers, with 90% accuracy in distinguishing credible versus noncredible memory and 76% accuracy in distinguishing adverse learning and memory, compared to 73.8% and 65% for English speakers, respectively. However, a significant limitation of this study is that the other two cognitive tests (MAT and AFT) that we employed were not validated across different racial groups or bilingual communities in any prior research. This reveals a clear need for further research. Further, this study assessed cognitive functioning in two domains only: memory and executive functioning. However, it is important to acknowledge that there are other significant cognitive domains—attention, language, psychomotor speed, and visuospatial function—that were not covered in our research (Pal et al., 2018). Future research should consider expanding the scope to encompass a broader range of cognitive tests across these additional domains.

With regard to measurement as well, the use of education as an indicator of lower socioeconomic status might not fully capture the mediating effect, as the quality of education

was not considered. Quality of education is crucial, especially considering that individuals in racial minority groups may be more likely to reside in neighborhoods with lower-quality schools compared to those in predominantly white areas. Additionally, due to financial constraints or unemployment, individuals from racial minority groups may be more likely to enroll their children in public schools, which may offer inferior education compared to private schools favored by white families with better financial resources (Yoon et al., 2018). Thus, future research should examine the quality of education as a component of SES when investigating the influence of racial inequality on cognitive health.

Furthermore, when it comes to measuring social resources, by dichotomizing marital status (currently married/cohabiting vs. not married), differences between those who were widowed versus divorced or separated, and single versus previously married and single versus currently married, were overlooked. Also, not including quality of marriage as a social resource is another limitation of this study as being married can also have negative effect if the quality of the marriage is poor (Liu and Waite, 2014). Further, only the overall MOS social support measure was used in this study. Thus, the potentially important and distinct role of different types of support (e.g., tangible support versus emotional support) included within the overall measure could not be addressed.

Finally, with regard to analysis methods, the study focused on specific relationships specified within the SPM model rather than the model as a whole. Also, while the SPM focuses on primary and secondary stressors as sequential and thus, as serial mediators (i.e., primary stressors lead to secondary stressors, etc.), this study focused on them as parallel mediators (i.e., ignoring the serial mediation process).

## 6.6 Theoretical Implications

Despite its limitations, this study has a number of important theoretical implications. Overall, the findings support the theoretical utility of Stress Process Model when focusing on cognitive functioning as a health outcome. Furthermore, incorporating an intersectionality approach effectively captures the dynamics of the interactions of gender and immigrant status with race and reveals their diverse effects on cognitive functioning. In doing so, they challenge generalized assumptions regarding the uniform experience of racial minorities (e.g., in the 'Healthy Immigrant Effect') or the better cognitive functioning of women compared to men. Therefore, future research should consider modifying the SPM by incorporating an intersectionality approach to assess the implications of interactions among different social positions on stress-related exposures and identify the social resources that might help to moderate the negative effect of these stressors on cognitive functioning.

Furthermore, the SPM that has been tested in this study illuminates how race, as a social status, acts as a background factor, contributing to the emergence of primary and secondary stressors. In Pearlin's work, SES characteristics were often conceptualized as indicators of social class and treated as background factors along with such factors as race, gender, and so on. Therefore, although previous research has addressed the role of such factors as education and income in influencing cognitive functioning, they tended to be conceptualized as background factors rather than as stressors that emanate from such factors as racial minority status. Conversely, this study focused on socioeconomic factors as sources of stress (or primary stressors) that lead to disparities in cognitive functioning. From this perspective, structural

inequalities based on race result in racial minority groups experiencing lower SES (lower income and non-homeownership) and greater exposure to psychological stressors (poorer SRH, poorer SRMH, lower life satisfaction, depression), which in turn, mediate the relationship between racial minority status and cognitive functioning in middle and later life. The incorporation of lower SES indicators as primary stressors and evidence indicating the resultant greater exposure to psychological stressors (serving as secondary chronic stressors), underscore how race can shape the stressors that individuals encounter and the degree to which they are exposed (i.e., a Differential Exposure hypothesis). This, in turn, establishes a cyclical pattern where the perpetuation of stressors contributes to a compounding impact on the health challenges, including cognitive health challenges, faced by racial minorities.

The findings of this study also indicated that income and homeownership mediated racial disparities in cognitive functioning whereas education did not. However, higher education has been shown to have a positive effect on cognitive functioning. This suggests a need to distinguish between education and these other dimensions of SES within the SPM. For example, perhaps education could be considered either as a background factor, along with race and other social locations, to assess its interaction effect with race on cognitive functioning. Alternatively, the SPM could be revised to include education as a pathway linking race and other social locations to SES to better understand how the broader impact of race on stress and cognitive functioning is influenced by educational experiences and achievements.

Moreover, the Stress Process Model tested here highlighted the importance of certain social resources such as marital status, social support, and active social participation or engagement, in reducing the adverse impacts of some of the primary and secondary stressors on cognitive health. These included findings indicating that marital status served as a buffer of the

impact of non-homeownership, as a primary stressor, and both MAT and AFT scores; that social support buffered the effects of household income on AFT as well as of poor SRMH and depression, as secondary stressors, on MAT and AFT scores; and that social participation functioned as a buffer of the relationship between household income and cognitive performance on MAT scores, between homeownership and REY-I scores, between depression and cognitive performance on all four measures. In general, however, the findings showed that although beneficial to the cognitive health of both whites and racial minorities, racial minorities benefited more than whites as social resources amplify the positive effects of socioeconomic protective factors (i.e., reduced primary stressors) and good subjective well-being (i.e., reduced secondary stressors) more for racial minorities than for whites. Findings of this nature support those reported by Sheffler and Sachs-Ericsson (2016) who found that perceived social support acts as a buffer against stress for African Americans at any stress level, whereas for Caucasians, it only buffers stress when the stress levels are low. In addition, the facts that SRH and life satisfaction were never moderated by any of the social resources on any cognitive test point to the particular importance of mental health as a secondary stressor compared with the global assessment of well-being. Furthermore, the lesser significance of network size and frequency of contact as buffers is also noted. These are often considered ‘structural’ indicators of support (i.e., what the informal network looks like and thus, the potential for support) while things like social support and social participation are considered ‘functional’ indicators (i.e., indicators of the support that is actually received) (Stringhini et al., 2012).

Finally, our findings also attest to the fact that that the SPM is appropriate when focusing on cognitive functioning as a health outcome. Previous researchers who developed the model as well as those who used it primarily focused on physical and mental health outcomes. For

instance, Gayman et al. (2018) employed the SPM to examine how the association between lower SES and depression is mediated by chronic stressors (e.g., discrimination) and moderated by self-esteem, mastery, and social support. Furthermore, Brown (2022) used the SPM in order to assess how long term stress can result in racial disparities in chronic illnesses like hypertension, stroke, heart disease, cancer and so on. Perhaps the most significant implication of this study lies in its emphasis on cognitive health outcomes and evidence suggesting that the model is also appropriate when focusing on cognitive functioning as a health outcome.

## **6.7 Research Implications**

Our findings also have a number of implications for future research. First, they point to the need for research to address structural factors within Canada that contribute to racial disparities in cognitive functioning among older adults. This includes intersections of race with other and multiple sources of structural inequality (such as social class as well as gender, immigrant status, etc.). Intersectionality is crucial to an understanding of health disparities because it recognizes the complex interplay between multiple social identities such as race/ethnicity and nativity. This perspective highlights that individuals do not experience cognitive or other health outcomes solely based on one identity, but rather, through the intersection of various social statuses, leading to unique social contexts and health pathways. For instance, while white immigrants may benefit from privileges associated with whiteness and exhibit better health profiles compared to their native-born counterparts, black, Asian and other immigrants may face additional stressors related to racism, nativism, and marginalization, leading to deleterious health consequences (Bonilla-Silva 2017; Brown et al., 2016; Waters

2014). The interaction of social identities has been shown to impact health outcomes in Canada. For instance, research by Veenstra and Patterson (2016) revealed that South Asian women in Canada exhibited a higher prevalence of hypertension compared to native-born white women, while South Asian immigrants faced elevated odds of hypertension, diabetes, and poor self-rated health compared to white immigrants. These disparities in health outcomes are often linked to experiences of racial discrimination, lower income levels, limited employment opportunities, and differential treatment within the education and healthcare systems. Given that immigrant status poses particular challenges for racial minorities compared to whites, future research should investigate the factors contributing to the heightened risk of cognitive deficits among racial minority immigrants compared to white immigrants. Additionally, researchers should investigate the interactions between race and other social locations (e.g., disabled, religious minority status) to understand their combined impact on cognitive health in later life.

In addition, however, several other structural factors may also contribute to the racial disparities in cognitive function during middle and later life observed in Canada. Previous research in the USA suggests that structural factors including racism and discrimination experienced by racial minorities affect their cognitive health (Fyffe et al., 2011; Wyatt et al., 2003; Zahodne et al., 2019). As the SPM focuses only on individual-level factors such as race rather than more macro-level structural factors such as racism as determinants of health, there is a need to expand the SPM to include such ‘upstream’ structural factors. For example, residential segregation and a lack of social, economic, and political resources in these segregated neighborhoods have been identified as causes of diminished cognitive abilities in racial minorities (Pohl et al., 2021; Sheffield et al., 2009). However, most of these explanations focus on blacks in the USA and may not entirely apply to non-White populations in Canada, given the

distinct histories of slavery and discrimination evident within the two countries. Nevertheless, it has been noted that slavery also existed in Canada (Cooper, 2006; Maynard, 2017) and that racial segregation and discrimination continue to exist in this country as well (Cénat, Kogan, et al., 2021; Siddiqi et al., 2017). Their impact on cognitive functioning requires detailed study.

Thus, our findings highlight the importance of identifying the root causes (e.g., racial discrimination) of the stressors that mediate the relationship between racial minority status and cognitive functioning. Scholars argue that black individuals in Canada experience more subtle forms of racism, with racial discrimination evident in lower education and higher unemployment rates (Torczyner, 1997). For example, Waldron (2021) highlighted lower educational attainment among black communities in Canada. Further, members of racial minorities more often experience job insecurity, low income and limited employment benefits (Block et al., 2019; Galabuzi, 2006; Ng and Gagnon, 2020) compared to their white counterparts. Furthermore, numerous other racial groups, including Latinos, Filipinos, Southeast Asians, Koreans, West Asians, South Asians, Arabs, and Chinese, report racial discrimination in economic well-being (Cassin et al., 2007; Khattab, 2022; Schirle and Sogaolu, 2020; Skuterud, 2010). However, even though education had a positive effect on cognitive functioning and racial minorities had higher levels of education than whites, it did not mediate the relationship between racial minority status and cognitive health. This finding suggests that educational attainment may not reduce the health gap between whites and members of racial minority groups. This finding is supported by research indicating that even when racial minority group members obtain higher education, they often have lower income levels, explaining the lack of health benefits from educational attainment for racial minorities (Assari, 2018; 2020). Future research must look into whether any

other measures of educational attainment (e.g., quality of education) can explain the racial gap in cognitive functioning in later life.

Further, racial minorities in Canada have been found not to own a home irrespective of their income levels. A study in Toronto, Canada suggests that even after controlling for SES (education, occupation and income), racial disparities in homeownership did not decline, suggesting that racial discrimination is likely a contributing factor within the housing market (Draden and Kamel, 2000). While residential segregation among blacks in Canada bears limited resemblance to the patterns observed in the USA, racial minorities exhibit more pronounced clustering in inner and outer suburban areas (Preston and Ray, 2020). Hence, it is crucial for future research to delve into the economic challenges faced by racial minorities in Canada and their impact on cognitive health.

Third, the findings also underscore the importance of addressing the disparities in cognitive functioning in middle and later life in more specific racial groups in Canada (e.g., South Asian, Chinese and Indigenous Canadians). Asian Canadians, often referred to as the largest racial minority group in Canada, are often viewed as a successful, privileged minority group with minimal exposure to racial discrimination (Huwang et al., 2021). For example, Siddiqi et al. (2017) report findings indicating that Asian-Canadians were less likely to experience discrimination than blacks and Aboriginals and consequently, were at lower risk of chronic diseases. However, some scholars argue that among Asian Americans, so-called brown Asian minorities like South Asians (e.g., those from India, Pakistan, Bangladesh) and Southeast Asians (e.g., Indonesians, Malaysians), encounter racism more than their 'whiter' counterparts (e.g., Koreans, Japanese) (Huwang et al., 2021). Also, research shows that even 'whiter' Asians internalize racism, stereotypes, and microaggressions, which in turn impact health outcomes such

as depression and anxiety (Liu and Suyemoto, 2016). The present study provides preliminary evidence that Asian-Canadians (i.e., South East Asians as they performed poorly on all measures and Filipinos, Koreans, South Asians, Japanese, West Asians as they performed more poorly on at least one measure compared to whites) do exhibit poorer cognitive functioning compared to whites. Hence, further investigations into the cognitive functioning of Asian-Canadian groups are essential to determine if they exhibit poorer performance compared to whites during middle and later life due to racial discrimination. It is also important to understand why some groups perform worse than others, why certain groups struggle in specific cognitive domains (e.g., memory) while others struggle in different domains (e.g., executive functioning), and whether these factors contribute to accelerated cognitive decline.

There is also a notable gap in research on racial disparities in intrapsychic or psychological strains in Canada. However, a study by C nat et al. (2022) revealed that black Canadians tend to report lower life satisfaction than whites due to experiences of microaggressions and racial discrimination. Similarly, Monte and Forte (2016) identified a positive correlation between racial minority status and reduced subjective health in Canada. Additionally, research by Cenat et al. (2021) found that racial discrimination contributes to a higher prevalence of depression within black communities in Canada. Our findings suggest that disparities in socioeconomic status and consequent exposure to psychological stressors may lead to racial inequalities in cognitive health outcomes in middle and later life. Therefore, future research should look at whether disparities in other indicators of SES (e.g., occupation, access to healthcare, neighborhood SES) and exposure to other psychological stressors (e.g., microaggression, internalized racism, and subjective status in society) mediate racial differences in cognitive functioning in the middle and later years of life.

In addition, our findings indicate that social resources can help to limit or buffer the negative effect of exposure to stressors on cognitive health in middle and later life among racial minorities. Future research should focus on how different social resources might benefit the cognitive health of different racial groups. Additionally, for stressors like depression that do not improve with available social resources, future studies must identify alternative social resources to address these challenges. Among the social resources that have been examined in the current study, social support is a very well known one which is capable of reducing the effect of racial discrimination on physical and psychological well-being. For example, it is suggested that the high levels of familism characteristic of Asian American collectivistic society provide support that can buffer the stress stemming from discrimination (Mossakowski and Zhang, 2014). Church-based social support has been found to moderate the negative effect of racial discrimination on the mental health of black Canadians (Graham and Roemer, 2012; Seawell et al., 2014). Support from social network members might directly influence health outcomes by moderating the effect of lower socioeconomic status. Through avenues such as providing information, practical help, emotional support, and guidance to resources, social support buffers the impact of lower SES on health (Koetsenruijter et al., 2015). Social support appears to play a vital role, potentially reducing the likelihood of negative health outcomes, such as cognitive impairment in later life, which are associated with stress arising from social discrimination. Hence, future research should investigate whether social support moderates the negative impact of racial discrimination, as well as racial inequalities in stressors like lower SES and perceived well-being, on cognitive health. Additionally, it should explore which types of social support are most beneficial for racial minority groups and the underlying reasons for this phenomenon.

Social participation emerges as a significant social resource that moderates the adverse effects of stressors like lower SES and intrapsychic or psychological strains, as evidenced in the current study. Other research suggests that social participation may attenuate the detrimental impact of discrimination on depression (Hope et al., 2018; Suryawanshi et al., 2016). Engaging in social activities such as sports, exercising in groups, or community festivals can mitigate the effects of lower SES and psychological strains. Additionally, social participation can foster the development of new sources of social support and prevent one from feeling lonely or isolated. Future research should include a focus on social isolation and loneliness when studying the effect of social resources on cognitive health. Moving forward, sociologists should explore what kind of social activities act as a protective factors against the stressors among non-whites, thereby reducing the risk of lower cognitive functioning in later life.

Our findings revealed that being married can moderate the negative effect of non-homeownership on cognitive functioning in middle and later life. Thus, having a spouse is a significant social resource that appears to buffers the negative effects of lower socioeconomic status to some extent. Prior research suggests that spousal support can buffer the impact of stress related to racial discrimination on mental health (McNeil et al., 2014, 2020). At lower socioeconomic levels, individuals encounter a multitude of stressors, underscoring the importance of resources such as marriage in safeguarding mental well-being. Studies by Carlson and Cail (2018) and Cohen and Wils (1985) demonstrate that marriage serves as a robust source of stress-buffering mechanisms, leading to decreased levels of depressive symptoms, particularly notable among those with lower SES. Additionally, marital support plays a crucial role in moderating the adverse effect of lower SES of on subjective well-being (Throop, 2011). Overall, marriage appears to extend mental health advantages to the economically disadvantaged by

reinforcing financial security, perceived well-being, reducing feelings of loneliness, and providing a larger social support network. In future, researchers should investigate how being married, including the importance of marriage quality, can buffer the negative effects of stressors like racial inequalities on cognitive health. Future research should also address the issue of why marriage serves as a buffer when home ownership is included as a measure of socioeconomic stress but not when household income levels are included as a stressor. Also, future researchers should focus on why it is that marriage appears to have different stress-buffering effects on different health outcomes (e.g., physical and mental health vs cognitive health).

Additionally, this study has confirmed that the interaction effect of race and gender significantly impacts the memory domain, while the interaction of race and immigrant status affects the executive functioning domain. Further, the moderating effects of social resources on stressors vary across cognitive domains without showing a consistent pattern. This variability underscores the need for future research to delve deeper into understanding the reasons behind these differences. Researchers should also include tests in additional cognitive domains such as language, visuospatial skills, and concentration to see if a more consistent pattern of moderating effects can be identified.

While some studies (e.g., Lasser et al., 2006; Siddiqi and Nguyen, 2010; Veenstra, 2009; Veenstra and Patterson, 2015) found that Canada does not show racial disparities in health unlike the USA, our research did find disparities in cognitive functioning in middle and later life. These findings align with those studies that suggest that racial discrimination experienced across various sectors may contribute to racial inequalities in chronic diseases in Canada, with black and South Asian Canadians experiencing higher rates of diabetes and hypertension compared to whites (Campbell, 2008; Ramraj et al., 2016; Veenstra and Patterson, 2016). It was found in the

current study that income, homeownership, SRH, SRMH, life satisfaction and depression- all independently mediate the relationship between race and lower cognitive functioning. Hence, future research should delve deeper into understanding the persistence of racial inequalities in health outcomes in Canada, particularly focusing on cognitive health, to validate our findings and uncover the social determinants underlying these disparities. Further, researchers must investigate the impact of racial inequalities in socioeconomic indicators and psychological well-being on racial disparities in cognitive health. Also, it remains unclear which racial minorities experience more racial discrimination and the underlying reasons. Hence, there is a critical need to compare different racial groups with each other as well as with various groups classified as white to discern variations in exposure to and vulnerability to discrimination. Furthermore, researchers should concentrate on identifying the patterns of racial discrimination occurring in various aspects of Canadian society and understanding how these discriminatory practices may affect health outcomes differently compared to the effects of racism in US society

## **6.8 Policy and Practice Implications**

This study also has important implications for policies and practices aimed at minimizing racial disparities and enhancing cognitive functioning in middle and later life. First, the findings underscore the critical need for policy action to address racial disparities in cognitive health outcomes among middle-aged and older adults within Canada. While the country has anti-racism strategies aimed at combating discrimination in healthcare, there is a notable absence of policies specifically targeting racial inequalities in health outcomes like cognitive impairment. It is imperative for policymakers to acknowledge and directly address the detrimental impact of

belonging to a racial minority group on this aspect of health. While anti-racism policies have been implemented in employment and awareness-building efforts, there is a pressing need for upstream policies that target structural factors contributing to racial disparities in socioeconomic status and psychological strain. While the mediators examined in this study did not fully account for racial disparities in cognitive functioning, they do point to their importance as potential contributors. To address these disparities, interventions aimed at increasing economic well-being (e.g., income, access to assets such as homeownership), and improving self-rated health, mental health, depression and overall life satisfaction are warranted. For example, policymakers can focus on creating policies to reduce racial wage gaps and increase access to affordable housing, thereby addressing disparities. As discrimination and microaggressions might be the reason behind lower SRH and SRMH, lower life satisfaction and depression in racial minorities, policies should be made that focus on reducing discrimination and microaggressions against racial minorities. By addressing these factors comprehensively, policymakers can work towards reducing the observed disparities in middle and later life and promoting health equity across racial groups.

Canada's Anti-Racism Strategy 2019–2022 includes several key components aimed at addressing racial discrimination and promoting diversity and inclusion. These include investing in community-based projects to tackle racism and discrimination in employment, encouraging social participation (e.g., encouraging participation in community sports, arts and culture), promoting justice to support youth and so on. The strategy also emphasizes public education and awareness and addresses hate crimes and online hate, aiming to combat discrimination and promote a more inclusive society (Government of Canada, 2021). However, a "one-size-fits-all" approach to this policy must be approached cautiously, as different racial groups may face

distinct challenges. Therefore, it is essential to tailor policies to the specific needs of each racial group.

The recognition that marital status, social support, and social participation can serve as moderators, amplifying the positive effects of socioeconomic protective factors (i.e., reduced primary stressors) and good subjective well-being (i.e., reduced secondary stressors) more for racial minorities than for whites carries significant policy implications. Firstly, there should be concerted efforts made to ensure that racial minority group members, particularly middle-aged and older adults, have access to ample formal and informal social support networks. This can be achieved by promoting social support and raising awareness about the importance of social support in preventing chronic illnesses such as cognitive impairment. Moreover, community-based activities that are effective and suit the needs and choices of different racial minorities should be organized to enhance social participation. Tackling barriers that hinder certain racial groups from establishing stable relationships and offering therapeutic support can foster marital stability and cultivate functional and emotional social support networks. Ultimately, policymakers must develop policies that cultivate a sense of belonging and equality among racial minority group members, fostering environments free from racial discrimination. This inclusive approach to social and economic well-being can contribute to a stress-free life and prevent cognitive decline in middle and later life stages.

## **6.9 Conclusions**

In conclusion, this study highlights the existence of racial disparities in cognitive functioning among middle-aged and older adults in Canada. It also reveals that these disparities

are particularly pronounced among racial minority immigrants compared to white immigrants and native-born racial minorities. By employing a modified version of the Stress Process Model, it also sheds light on some of the mechanisms underlying these disparities. Racial inequalities in indicators of socioeconomic status and psychological strain act as stressors contributing to cognitive health disparities. However, it also underscores the potential of social resources such as marital status, social support, and social participation to reduce the negative impact of these racial inequalities. However, there is a need for research to delve into the more upstream factors, including racial discrimination across various societal domains that may have an impact on the cognitive health of racial minority group members in middle and later life. Exploring racial discrimination and advocating for policies at a structural level represents a crucial step towards eliminating racial inequalities that detrimentally affect cognitive health outcomes. In summary, this study underscores the urgent need for targeted policies addressing systemic racial inequalities in order to foster equitable cognitive health outcomes among diverse populations.

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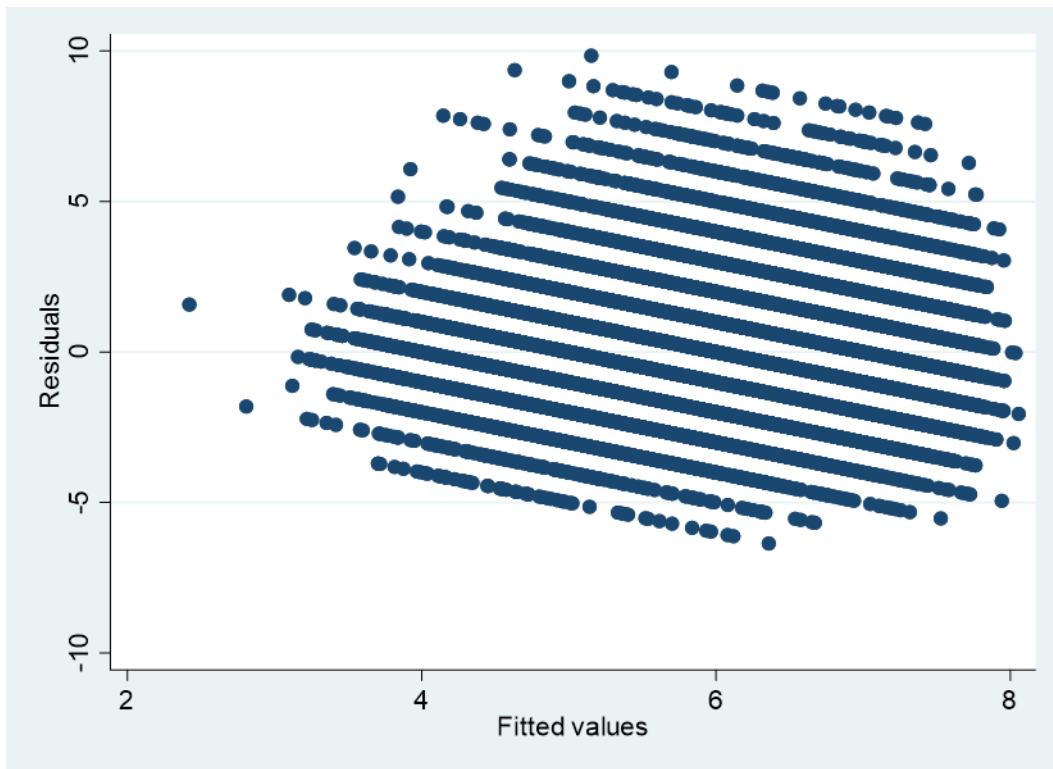
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# APPENDICES

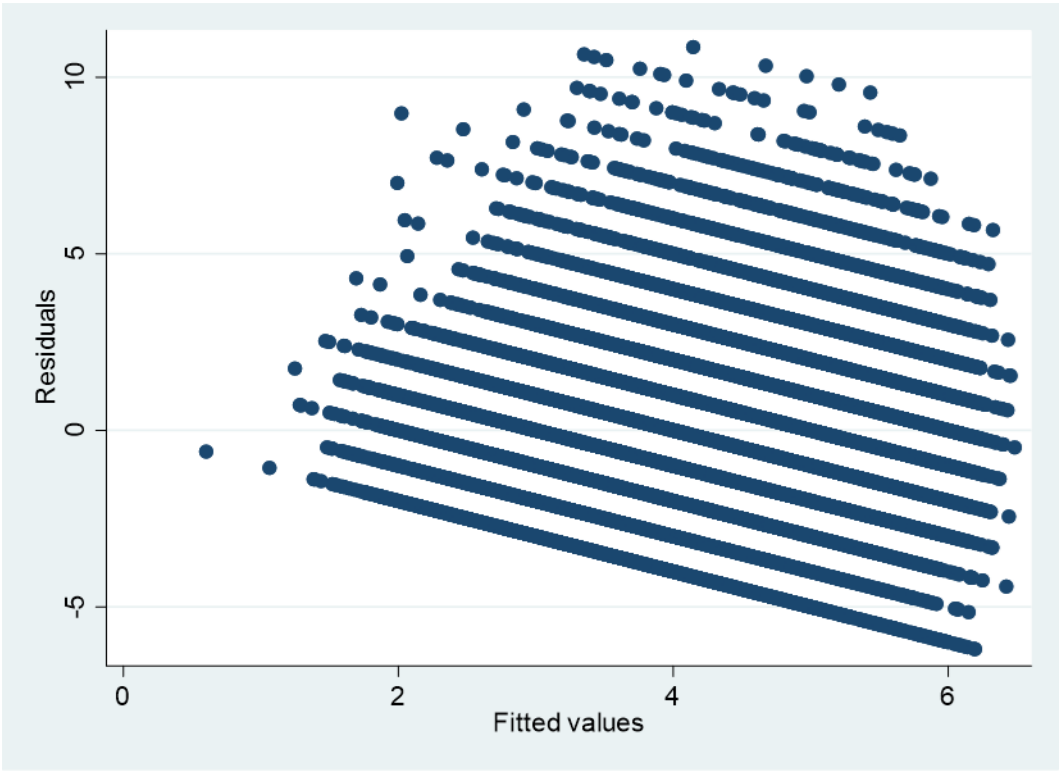
## Appendix A

### Heteroscedasticity Check for all Dependent Variables

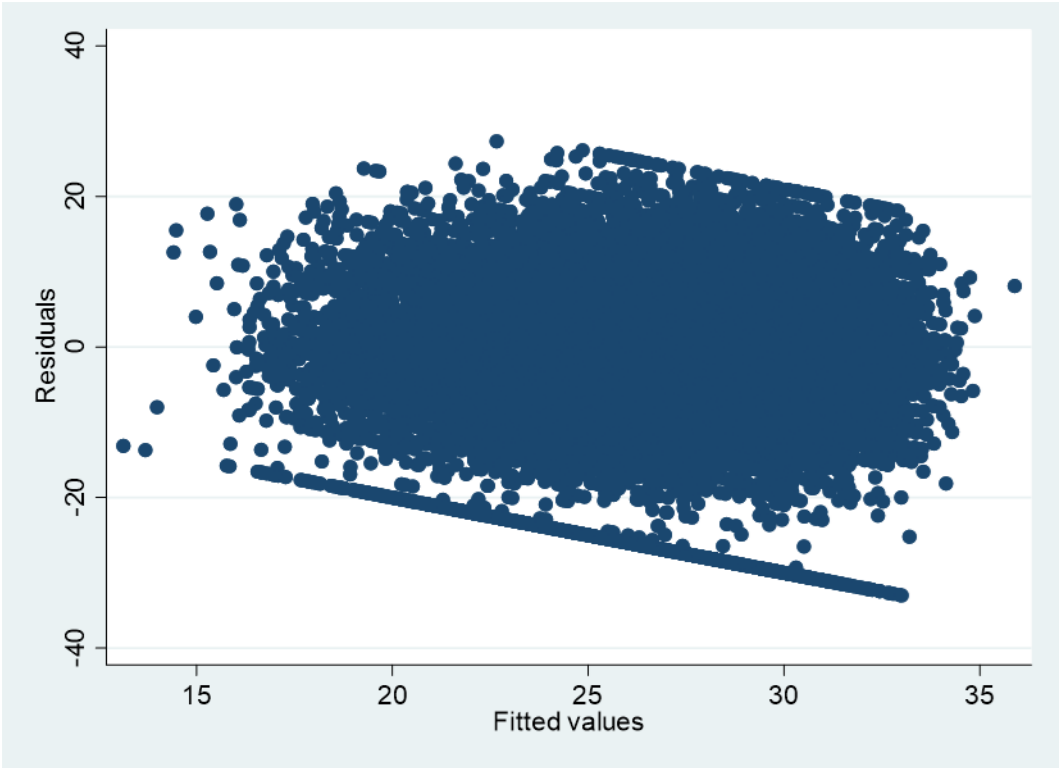
Rey-I Residuals by Fitted



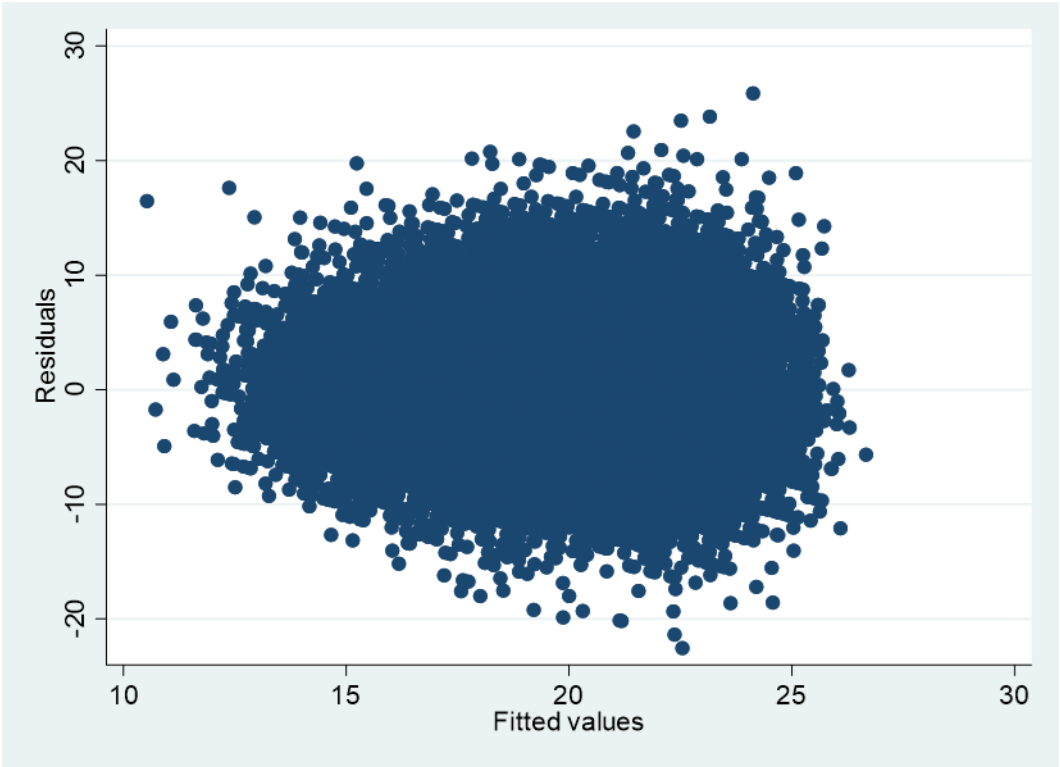
Rey-II Residuals by Fitted



MAT Residual by Fitted



AFT Residual by Fitted



## Appendix B

### Normality: Skewness and Kurtosis Statistics for all Independent Variables

Variables	Skewness	Kurtosis
ReyI	0.469	3.668
ReyII	0.510	3.559
MAT	-0.550	3.715
AFT	0.208	3.049
Age	0.252	2.064
Religion	1.415	3.003
Gender	-0.038	1.001
Race	4.183	18.502
Language	1.618	3.069
Chronic illness	-3.070	10.430
Immigrant status	1.061	1.864
Cohort	-0.350	4.115
Education	-1.609	4.115
Household income	0.169	2.273
Homeownership	2.056	5.224
Self-rated health	-0.457	2.871
Self-rated mental health	-0.491	2.786
Depression	1.337	5.033
Life satisfaction	-1.142	3.888
Social support	-1.218	4.519
Social network size	1.242	4.490
Frequency of Contact	-0.271	2.985
Marital status	1.245	2.642
Social participation	-0.777	5.317

## Appendix C

### Multicollinearity Check for all Variables

<b>Variables</b>	<b>VIF</b>
Age	2.08
Religion	1.05
Gender	1.10
Race	1.15
Language	1.15
Chronic illness	1.08
Immigrant status	1.26
Immigrant's' length of stay	1.15
Education	1.12
Household income	1.63
Retirement status	1.94
Homeownership	1.17
Self-rated health	1.45
Self rated mental health	1.52
Depression	1.34
Life satisfaction	1.53
Social support	1.31
Social network size	1.06
Social Network Tie (with Children)	1.08
Social Network Tie (with Siblings)	1.20
Social Network Tie (with relatives)	1.19
Social Network Tie (with friends)	1.03
Marital status	1.37
Social participation	1.10
<b>Mean VIF</b>	<b>1.34</b>