

Examining the Association between Functional Social Support, Marital Status, and Memory in
Middle-Aged and Older Adults in Canada: A Mixed Methods Study

by

Paniz Haghighi

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Examining Committee Membership

The following members served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

Supervisor

Mark Oremus, Professor, PhD
School of Public Health Sciences
University of Waterloo

Internal Members

Suzanne L. Tyas, Associate Professor, PhD
School of Public Health Sciences
University of Waterloo
Leilei Zeng, Professor, PhD
Department of Statistics and Actuarial Science
University of Waterloo
Samantha B. Meyer, Associate Professor, PhD
School of Public Health Sciences
University of Waterloo

Internal-External Member

Steven E. Mock, Associate Professor, PhD
Department of Recreation and Leisure Studies
University of Waterloo

External Examiner

Arne Stinchcombe, Associate Professor, PhD
School of Psychology
University of Ottawa

Author's Declaration

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Statement of Contributions

This thesis includes three manuscripts prepared for publication: a systematic review, a quantitative study (Phase 1), and a qualitative study (Phase 2). In all three manuscripts, I served as the lead author, with primary responsibility for conceptualizing the study design, carrying out data collection and/or analysis, and drafting a manuscript. My coauthors provided guidance throughout the research process and feedback on draft manuscripts.

Systematic Review:

This research was conducted by Paniz Haghighi under the supervision of Dr. Mark Oremus. Paniz Haghighi designed the review and completed the data analysis with assistance from Dr. Mark Oremus. Jackie Stapleton contributed to designing the searches. Paniz Haghighi drafted the manuscript, and each author provided intellectual input on manuscript drafts.

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design and creation of the semi-structured interview guide. Paniz Haghighi conducted the one-on-one semi-structured interviews and thematic analysis. Paniz Haghighi drafted a manuscript, and each author provided intellectual input on manuscript drafts.

Abstract

Although several studies have found that functional social support (FSS) promotes memory through stress-buffering mechanisms, the role of marital status in shaping this association remains underexplored. This thesis – a sequential explanatory mixed-methods study – is the first research to examine whether marital status modifies the association between FSS and memory in community-dwelling, middle-aged and older adults (45-85 years old).

Data for the quantitative portion of the study were obtained from the Tracking Cohort of the Canadian Longitudinal Study on Aging (CLSA). Memory was regressed on FSS, adjusting for various sociodemographic, lifestyle, and health-related covariates, in a linear mixed effects model. The moderating effect of marital status was assessed by adding its interaction with FSS to the model. Results showed significant and positive adjusted associations for overall FSS (β : 0.07; 95% CI: 0.01, 0.13) and two FSS subtypes, namely positive interactions (β : 0.06; 95% CI: 0.01, 0.11) and affectionate support (β : 0.05; 95% CI: 0.00, 0.11), with memory. However, the interaction between marital status and FSS (overall and subtypes) was not statistically significant (likelihood ratio test p-value = 0.75), indicating that FSS did not have differing effects on memory according to marital status. Two sensitivity analyses – one stratifying the sample by baseline marital status and another comparing different missing data approaches – confirmed the initial findings.

For the qualitative portion, semi-structured interviews were conducted with a sample of 18 community-dwelling adults who resembled the CLSA population and reported different categories of marital status. Each interview was audio recorded, transcribed verbatim, and thematically analyzed with the goal of explaining and contextualizing the quantitative results. Three major themes emerged from the interviews to help explain why marital status, contrary to *a priori* expectations, did not impact the FSS-memory association: “*learning to cope*” – participants used other alternatives besides a spouse to deal with memory challenges; “*context matters*” – contextual factors such as marital quality may affect this association; and, “*doing more harm than good*” – some spouses may provide too much support, reducing participants’ autonomy to stimulate their own cognitive processes.

The thesis findings highlight the complexity of marital relationships and emphasize the need to consider factors such as satisfaction with one's marital status and adequacy of support to provide a comprehensive understanding of how social and marital dynamics impact cognitive trajectories. This research suggests public health initiatives focused on enhancing social support could promote cognitive health in aging populations, regardless of marital status.

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List of Abbreviations

ADL	Activities of Daily Living
AFF	Affectionate Support
AIC	Akaike Information Criterion
β	Regression Coefficient
CI	Confidence Interval
CLSA	Canadian Longitudinal Study on Aging
EMOINFO	Emotional/Informational Support
FSS	Functional Social Support
IADL	Instrumental Activities of Daily Living
IQR	Inter-quartile Range
POSINT	Positive Social Interactions
RAVLT	Rey Auditory Verbal Learning Test
SD	Standard Deviation
TANG	Tangible Support
WDS	Widowed, Divorced, Separated

Chapter 1

Introduction

1.1 Overview

This thesis assessed whether marital status modifies the association between functional social support (FSS) and memory in middle-aged and older adults. Memory was selected as the outcome because of its vital role in healthy aging (1), which involves maintaining physical, mental, and social well-being, as well as autonomy, as individuals grow older. Healthy aging enables people to lead fulfilling lives by allowing them to more fully participate in their communities and engage in activities of their choice, thereby fostering a sense of purpose and fulfillment, while reinforcing personal values (2). Staying physically and mentally active is important for maintaining mobility and independence and preventing cognitive decline in older adults (2,3).

Studying memory is important because age-related declines in memory present daily challenges for older adults, such as difficulty remembering dates, appointments, or locations. In fact, one of the most common complaints of older adults is a reduced ability to learn and recall new information (4). Memory decline hinders one's ability to carry out basic and instrumental activities of daily living (e.g., dressing, bathing, shopping, managing finances, preparing meals, and social participation). Declines in memory are also strong markers for the incidence and prevalence of various neurocognitive disorders such as Alzheimer's disease (5). Approximately 750,000 Canadians are currently living with Alzheimer's disease or another form of dementia (6); this number continues to rise annually, mainly due to the growth of Canada's older population. Such rises increase pressure and demand on Canada's healthcare system. Therefore, now more than ever, it is important to investigate modifiable risk factors for memory to help offset future health challenges in aging populations. One such modifiable risk factor is FSS.

FSS refers to one's perception of whether members of their social network will be available to provide help and assistance. Several cross-sectional and longitudinal studies have found higher levels of FSS to be linked with better memory performance (7–10). A number of theoretical frameworks have been proposed to explain this association, including the stress-buffering hypothesis, use-it-or-lose-it theory, cognitive reserve theory, and social control and

social identity theory. The stress-buffering hypothesis is particularly suitable for explaining the association between FSS and memory due to its focus on the perceived availability of support (FSS), rather than merely the quantity of social contacts or the frequency of interactions (structural social support). This theory proposes that FSS mitigates the negative impact of stress on one's cognitive health by providing a sense of stability and the resources needed to reframe stressful situations as manageable (11). This support helps reduce chronic stress, which has been shown to negatively impact brain function and memory (12). Stress reduction can prevent or delay cognitive decline, promote resilience, and enhance mental well-being in older adults. However, while evidence and theory support the beneficial effects of FSS on preserving memory, no studies have explored how this association may differ according to one's marital status.

Research suggests that FSS may differentially affect the memory domain of cognitive function depending on whether one has access to a spouse to provide support (13). Marriage is a source of FSS because a romantic partner can expand one's social network and serve as a confidant during times of need (14,15). Research has consistently shown that married individuals report better cognitive function than their unmarried counterparts (16–18). Therefore, the possibility exists that while FSS promotes better memory through stress-buffering mechanisms (11), FSS from a spouse can foster more effective coping efforts and further reduce stress during times of hardship, thereby providing added protection against memory decline. Thus, it is important to consider whether FSS in married or common-law individuals, compared to unmarried/unpartnered individuals, is distinctly associated with memory.

Despite the rationale supporting marital status as a modifier of this association, a recent systematic review (19), undertaken as the first step in this thesis, identified only four studies that explored marital-related variables alongside FSS and memory (13,20–22). These four studies compared support from spouses to other support providers, such as friends, rather than specifically examining marital status as a modifier. However, the unique relational aspects of different forms of marital status provide a rationale for examining the moderating effect of marital status on the association between FSS and memory. More specifically, whether one is married, single, etc. shapes access to, and reliance on, different forms of FSS, highlighting the importance of considering marital status as an effect modifier.

Research should consider the complex dynamics of social relationships, such as marital status, to inform targeted interventions aimed at enhancing support structures for both married and unmarried individuals at risk of memory decline. Such research initiatives may ultimately foster better cognitive outcomes across different demographic groups, which is particularly important given Canada's aging population.

Chapter 2

Literature Review

This chapter provides a comprehensive overview of research on the impact of FSS on memory in the aging population. The chapter also discusses the interconnection of these variables with marital status. It begins by defining FSS and memory while also examining commonly used measurement tools and key risk factors associated with these concepts. The chapter then explores theoretical frameworks that explain the associations between FSS, marital status, and memory. It reviews relevant studies in which FSS serves as the exposure variable and memory as the primary outcome. Finally, the chapter summarizes specific research exploring the impact of marital-related variables on the association between FSS and memory, highlighting gaps in the literature that warrant further investigation.

2.1 Functional Social Support (FSS)

Social support is composed of both structural and functional aspects (23). Structural social support refers to quantitative characteristics of social relationships, such as the number and type of individuals in one's social network, the frequency of interactions with these individuals, and the number or frequency of participation in events outside the home (24). FSS – the focus of this thesis – refers to one's perception of whether members of their social network will be available to provide help and assistance when needed (25); this may include emotional support (e.g., having someone to talk to), informational support (e.g., receiving advice), tangible support (e.g., practical help), affectionate support (e.g., expressions of love and care), and having someone to engage in enjoyable activities with (26). Although much of the literature has focused on structural aspects of social support, many researchers believe a greater emphasis should be placed on FSS because it represents the actual amount of help that one believes will be available to satisfy unmet needs (26).

2.1.1 Impact of FSS on Health

Research examining the association between social engagement and health dates back to 1979, when Berkman et al. found a negative association between social ties and mortality in a sample of 6,928 adults in the United States (27). Since the publication of this article, many studies have reported inverse relationships between social support and functional limitations (28), cardiovascular disease (29), various mental illnesses (30), and mortality (31).

In recent years, a so-called “second wave” of research, motivated by Berkman et al.’s findings, has investigated the health impact of various qualitative aspects of social relationships, including marital quality, FSS, and satisfaction with received social support (32). Many studies examined the beneficial impacts of FSS on improving overall physical and mental health, including protecting against coronary heart disease (33), hypertension (34), diabetes (35), depression (36), and loneliness (37).

FSS is a source of practical and psychological support in times of need. This support fosters a sense of belonging and the ability to cope with stressful experiences, thereby promoting good health (32). Specifically, FSS has beneficial effects on health through social (stress buffering), psychological, and behavioural (health-promoting) mechanisms (38,39). See Section 2.3 for a discussion of these mechanisms.

2.1.2 Measures of FSS

FSS is often measured by asking participants about the level of support they believe is available from loved ones, including affectionate and emotional support, or the availability of reliable help to perform personal tasks. The Medical Outcomes Study – Social Support Survey (MOS-SSS) (26) is a widely used measure of FSS. This questionnaire asks about perceived social support across four subscales: emotional/informational support (having someone to confide in and provide advice), affectionate support (having someone who shows love and affection), tangible support (having someone to help complete daily tasks and chores if needed), and positive social interactions (having someone with whom to share good times). Other measures, such as the Interpersonal Support Evaluation List (ISEL) (40) and the Multidimensional Scale of Perceived Social Support (MSPSS) (41), have also been used in

research. Like the MOS-SSS, scales such as the ISEL and MSPSS ask respondents to answer a series of questions about perceived levels of support in areas such as performing physical tasks, receipt of emotional support, and feelings of belonging. Currently, no gold standard exists for measuring FSS, leading many researchers to develop their own questionnaires or modify existing ones to address their research objectives. This inconsistency in measurement tools has contributed to heterogeneous findings in the literature on FSS and cognitive function, including memory (42,43).

2.2 Memory

2.2.1 Definition and Key Concepts

Cognition is a broad term referring to the mental processes involved in the acquisition of knowledge, thinking, reasoning, problem-solving and decision-making (44). The Diagnostic and Statistical Manual of Mental Disorders - 5th Edition (DSM-5) recognizes six domains of cognitive function: (1) learning and memory (free recall, cued recall, semantic and autobiographical long-term memory, implicit learning); (2) executive function (planning, decision-making, inhibition, flexibility, and responding to feedback); (3) perceptual-motor function (visual perception, visuo-constructional reasoning, perceptual-motor coordination); (4) language (naming, word finding, fluency); (5) social cognition (recognition of emotions, insight); and (6) complex attention (sustained attention, divided attention, processing speed) (45). These domains collectively form what is referred to as ‘global’ cognitive function.

Memory – the focus of this thesis – is the capacity to encode, store, and retrieve information (4). Memory is generally classified into four types: episodic, semantic, implicit, and working memory (46). Episodic memory (also referred to as autobiographical memory) is the ability to actively retrieve information about personal experiences or events from one’s past. Semantic memory is defined as the storage of general conceptual and factual knowledge about the world that is gathered throughout one’s life. Implicit memory refers to recalling previous experiences without intentional retrieval or conscious effort, such as riding a bike. Lastly, working memory is the temporary storage and retrieval of information over short time periods.

Memory is central to healthy aging because it is associated with everyday physical, behavioural, and social functioning, including decision-making, performing job-related tasks, and maintaining functional independence. Memory is also essential for social interactions with others, which is necessary to maintain emotional well-being (47). Changes in the memory domain of cognitive function are commonly linked to the aging process and may lead to daily challenges for older adults, including difficulty remembering dates, appointments, and locations. Declines in memory are strong markers for various neurocognitive disorders such as Alzheimer's disease (5). Currently, 40 to 47% of adults over the age of 65 years experience memory impairments (48) and 7% of these individuals report living with a major neurocognitive disorder (49). Thus, investigating potentially modifiable risk or protective factors for memory is crucial to help offset health challenges and promote healthy cognitive aging in middle-aged and older adults (50).

2.2.2 Risk and Protective Factors for Memory

Although the most impactful risk factor for declines in memory is age (4), several additional factors affect this cognitive domain in middle-aged and older adults. For instance, lifestyle factors such as physical inactivity (51), excessive alcohol consumption, and smoking are linked to memory decline (52–54). Conversely, higher socioeconomic status (SES) and more years of formal education are positively associated with memory in this age group (55,56).

Existing literature has also shown links between memory and depression, stress, and social environments (12,42,57,58). For example, stress may lead to less effective functioning of neural networks during the acquisition, consolidation, and retrieval of information, mainly due to its detrimental effects on the hippocampus, a central structure of the brain involved in memory processes (12). A greater number of social contacts (structural social support) and greater availability of perceived support from these individuals (FSS) may also protect against memory decline and neurocognitive disorders (8,20,24,50,59,60), along with other social factors such as being married or cohabitating versus living alone (17,18,61). In fact, increased structural and functional social support have both been cited as potential buffers against memory loss in various

cross-sectional and longitudinal studies (11,50,62,63). A more in-depth discussion about the influence of social support on memory is presented in Sections 2.3.1 and 2.3.2 below.

2.2.3 Measures of Memory

Similar to FSS, no gold standard exists for measuring memory. A wide variety of question- or task-based instruments have been developed to measure cognitive function or memory. The Mini-Mental State Examination (MMSE) (64) is a commonly used screening tool in clinical and research settings for global cognitive function. Assessment tools specifically for memory include the Rey Auditory Verbal Learning Test (RAVLT) (65), East Boston Memory Test (EBMT) (66), Wechsler Memory Scale (WMS) (67), and California Verbal Learning Test (CVLT) (68). Tests of memory are common in aging research, given that memory is one of the first cognitive domains compromised as individuals get older (69,70).

2.3 FSS and Memory

2.3.1 Empirical Evidence Linking FSS and Memory

Higher levels of FSS have been associated with better cognitive function, specifically memory, in various cross-sectional and longitudinal studies. A recent systematic review by Mogic et al. (71) found 17 articles that examined the association between FSS and memory. Across these articles, various domains of FSS were investigated, including emotional, perceived, instrumental, affectionate, and positive social support, with many studies using more than one FSS domain in their analyses.

Overall, evidence from the 17 articles included in the review generally pointed to a positive association between FSS and memory in middle-aged and older adults, with similar directions of effect reported across most of the different domains of FSS and types of memory. For instance, in a cross-sectional study with a sample of approximately 12,000 adults from the Canadian Longitudinal Study on Aging (CLSA), Oremus et al. (72) found that positive social interactions and affectionate support were both positively associated with immediate and delayed recall memory. Hughes et al. (8) examined data from 217 participants in the Charlotte County

Healthy Aging Study over a five-year period; they reported positive associations for instrumental support and satisfaction with social support and memory over time (8). Moreover, in their examination of 838 older persons from the Rush Memory and Aging Project, Krueger et al. (73) reported that perceived social support was positively associated with working, episodic, and semantic memory. Subsequent to the publication of Mogic et al.'s review, additional studies also reported positive associations between FSS and memory (74,75). Given these findings, FSS appears to have beneficial effects for preserving cognitive function, specifically memory, in middle-aged and older adults. However, not all findings from Mogic et al.'s review showed positive associations. For example, Sims et al. (62) found inverse associations for tangible support and positive social interactions with nonverbal recall memory in a sample of 175 community-dwelling older adults in Baltimore, Maryland. These inconsistencies in findings can be attributed to several methodological limitations in the existing literature, including the focus on overall FSS or a single FSS subtype, the reliance on samples of only older adults, and the use of predominantly cross-sectional study designs. This highlights several gaps in the literature, emphasizing the need for more nuanced investigations that explore a broader range of FSS subtypes, include both middle-aged and older adults, and utilize longitudinal designs – areas this thesis aims to address.

2.3.2 Theoretical Models Linking FSS and Memory

Numerous interconnected and overlapping theories have been proposed to explain the association between FSS and memory, including the cognitive reserve theory, social control and social identity theory, use-it-or-lose-it theory, and stress-buffering hypothesis. Each of these theories is discussed in the following sections.

2.3.2.1 Cognitive Reserve Theory

Cognitive reserve refers to the brain's ability to actively mobilize pre-existing (or create new) compensatory cognitive processes to counter susceptibility to brain aging, pathologic changes, or damage (76,77). When age- or disease-related brain alterations occur, individual

differences in these cognitive processes can influence how successfully a person copes with these changes (76). Independent of structural brain characteristics like brain size (i.e., brain reserve), pathological damage will have differential effects on individuals according to their cognitive reserve levels (77). The cognitive reserve theory suggests that differences in individuals' resilience to age-related cognitive decline may be attributable to certain lifestyle choices made across the lifecourse. More specifically, engaging in cognitively stimulating activities, like social interactions, can help build a "reserve" that protects against cognitive decline, allowing individuals to better compensate for age-related brain pathology (76). Social interactions and engagement can be a powerful form of mental stimulation, contributing to enhanced cognitive and neural flexibility by enabling the use of cognitive strategies, strengthening existing brain networks, or recruiting alternative brain networks (78). Interactions with social network members often involve complex communications, recollection of shared experiences, and shared problem-solving, all of which provide psychological and cognitive stimulation, thereby building up cognitive reserve (79).

Studies suggest that individuals with larger and more diverse social networks may experience greater social enrichment, leading to better cognitive function, even in the face of brain atrophy (59,80). Conversely, being socially isolated deprives one of this stimulation and does not contribute to building cognitive reserve (79). Both structural and functional social support are important contributors to building cognitive reserve (79,81). Many studies suggest that cognitive reserve can be strengthened by having good quality FSS available from social network members. For example, one study by Glymour et al. (82) found that greater emotional support was associated with stronger cognitive resilience in a sample of 272 adults aged 45 years or older who had experienced a stroke.

2.3.2.2 Social Control and Social Identity Theory

Social control and social identity are fundamental concepts to help understand the mechanisms regulating human behaviour and cognitive processes. Social control refers to the ways in which social expectations and support from one's social network (e.g., interactions with family or friends) can influence behaviour. Sometimes social control reinforces healthy

behaviours or dissuades one from engaging in unhealthy behaviours (83). On the other hand, social control can lead to the adoption of unhealthy behaviours (e.g., tobacco use or excessive alcohol consumption) through peer pressure. Social identity refers to an individual's sense of self and is derived from group memberships and social roles (84). These concepts are intricately linked to cognitive processes, particularly memory, as social experiences and identities shape how individuals engage in certain health behaviours, ultimately influencing their ability to perceive and recall information.

According to this theory, individuals categorize themselves into social groups and adopt health behaviours that align with the norms and values of their social groups, while discouraging behaviours that do not align with these beliefs (84). For instance, strong social norms against smoking can provide a supportive environment encouraging individuals to quit or reduce their smoking habits, or not take up the habit entirely. In other situations, health-promoting FSS from one's social network could be low; low FSS is linked to unhealthy behaviours such as smoking (85,86), physical inactivity (87–89), and alcohol consumption (90,91), all of which can negatively affect memory (51–54). Therefore, this theory emphasizes how FSS can motivate health behaviour through (a) the direct effect of being prompted or persuaded by social ties to engage in healthier lifestyles and (b) the indirect effect of avoiding risky health behaviours out of obligation to one's significant others (e.g., avoiding smoking to keep a spouse satisfied or eschewing extreme sports out of a sense of family duty).

FSS from loved ones not only influences health behaviours, but also affects memory processes by shaping how individuals recall their past attitudes and experiences. Specifically, group membership enhances the prominence of certain memories, leading individuals to remember events that reinforce their social identity more vividly than those challenging it. For instance, memories associated with in-group experiences tend to be more vivid and positive, while those related to out-group interactions may be less detailed or biased. This selective memory process helps individuals maintain group cohesion and identity, but it can also result in distorted perceptions of out-group experiences (84). Taken together, the social control and social identity theory highlights how social structures shape not only health behaviours, but also cognitive processes such as memory, influencing how individuals encode, retrieve, and interpret information about themselves and others.

2.3.2.3 Use-It-Or-Lose-It Theory

The "use-it-or-lose-it" theory of cognitive aging is another key model linking FSS with cognitive function. Mental functions, such as memory, can be better maintained with continued use, and cognitive decline can be slowed when these functions are actively engaged (92,93). However, the disuse of cognitive processes or skills will result in brain atrophy (92), whereby inactive synaptic connections in the brain become weak over time and are eventually lost (94). Social interactions, which involve recalling shared experiences, problem-solving, and communication, provide opportunities for mental stimulation that strengthen cognitive processes like memory (93). This theory is supported by research showing that the cognitive domains most involved in social interactions, such as executive function, episodic memory, language, and processing speed, are often linked to both structural and functional aspects of one's social network (13,50,95,96). Thus, maintaining active social connections and engaging in social activities can preserve cognitive function by offering mental challenges that promote more efficient use of neural networks and slow age-related declines in memory.

Although the use-it-or-lose-it and cognitive reserve theories may appear similar to one another on the surface, they each offer distinct explanations about the link between FSS and memory. The use-it-or-lose-it theory emphasizes the direct benefits for maintaining cognitive function that accrue from frequent engagement in cognitively stimulating activities (i.e., social interactions). In contrast, the cognitive reserve theory suggests that the accumulation of mental, social, and educational experiences across the life course builds a reserve, allowing individuals to better withstand age-related pathological changes. While both theories highlight the importance of social engagement, the former focuses on ongoing stimulation to preserve memory function, whereas the latter highlights that resilience built over time may buffer against cognitive decline.

2.3.2.4 Stress-Buffering Hypothesis

The stress-buffering hypothesis proposes that FSS helps to mitigate the impact of stressful life events on an individual's health (11). Large or small social networks, provided they afford a greater availability of support to individuals, may positively influence one's well-being by providing a sense of stability, positive affect, and self-worth (11); these networks may also provide individuals with the resources to reframe stressful situations as less serious and potentially solvable. Such outlets may counteract the physiological changes associated with stress, such as elevated blood cortisol levels, which have been shown to negatively affect the areas of the brain that are responsible for memory (42). Stress can also induce structural changes in the hippocampus, a key brain region involved in cognitive function, specifically memory (42). However, reduced strain on one's emotional and mental health can help prevent hippocampal atrophy and cognitive decline. Thus, consistently met needs may help to buffer physiological stress reactions and support cognitive health through the introduction of effective coping mechanisms (11).

While no single theory optimally explains the FSS-memory relationship, this thesis highlights the stress-buffering hypothesis due to its particular relevance to FSS (as opposed to structural social support) and its association with memory. Specifically, the stress-buffering hypothesis emphasizes how the perceived availability of support can help mitigate the negative effects of stress. However, the other theoretical frameworks discussed earlier also offer relevant and complementary explanations for the link between FSS and memory.

2.4 Marital Status

Marriage is a key source of FSS among middle-aged and older adults, especially as health declines (15). Currently, approximately 60% of Canadian adults aged 65 years or older report being married or living with a common-law partner (97). Research has consistently shown that married people or those in common-law relationships fare better in terms of both physical and psychological health compared to their unmarried counterparts, especially among middle-aged and older adults (98,99). The health benefits of marriage or common-law relationships arise from

the tendency of spouses (defined as a marital or common-law partner) to encourage healthy behaviours and provide constant sources of FSS (98).

2.4.1 Marital Status and FSS

Despite marriage being a key source of FSS, most of the literature on the topic has focused on the association between marital status and elements of structural support, such as network size and composition, rather than FSS. For instance, research has shown that individuals who are married or in common-law relationships report greater social contacts and higher numbers of close friends than those who are unmarried (24,25).

Turning to FSS, entering a romantic relationship may expand one's social network through immersion in the partner's social network, thus increasing the number of potential sources of FSS. Indeed, the partner themselves may serve as a confidante during times of need, providing individuals with a sense of social integration and belonging (14,15). Spouses are also the most likely source of instrumental support compared to other sources (i.e., children, family, and friends) (100,101) and are the most common source of emotional support, especially for men (102). However, these sources of support may be less available among individuals who are divorced, separated, or widowed. For widowed individuals, the death of a spouse signifies a major loss of emotional support, especially among older adults who often have smaller social networks due to health problems and network shrinkage (e.g., death of friends and relatives over time) (103). Taken together, a substantial amount of FSS in middle-aged and older adults comes from spouses, ultimately leaving divorced, separated, single and widowed people at a disadvantage when they need to access individuals who can help with unmet needs (103). Marital status is therefore important to consider in any exploration of FSS as a psychosocial exposure in aging research.

2.4.2 Marital Status and Memory

Marital status has been associated with differences in memory performance (16–18). Specifically, married people consistently report better memory performance than single or

widowed individuals (16–18). The health benefits of marital relationships may be attributed to several factors such as increased physical and financial assistance, affection and emotional guidance, reduced stress, and the tendency of spouses to encourage health-promoting behaviours, all of which are tied to FSS. Each factor will be discussed in detail in the following sections.

Some researchers suggest that the observed link between marital status and cognitive health may be attributed to the material resources and physical support received from a marital partner (104,105). Studies show that older adults generally prefer to continue living independently in their communities as they age (15). Spousal relationships are crucial in facilitating this, particularly in terms of providing informal support as health declines, which can positively impact the recovery process (104). In addition, the pooling of economic resources in a marriage may serve many benefits for the health of older adults, including increasing access to good quality medical care, support resources, and health insurance (106). Conversely, widowed, separated, and divorced individuals are often worse off than their married counterparts because of the splitting of resources that comes with marital dissolution (104). This reduction in material resources may, in turn, be detrimental to the cognitive function of those who are no longer married, as it can limit access to stable housing, high-quality nutrition, mental health counselling, or opportunities for social and cognitive engagement – all key factors that can contribute to cognitive resilience.

Other researchers have claimed that emotional support and guidance from a marital partner improve cognitive health (105,107). Having a trusted confidante can be seen as comforting and may help individuals cope with difficult situations, which can contribute to cognitive resilience. Emotional support may also reduce symptoms of depression and anxiety, which are linked to poorer memory performance (57,58). Moreover, in line with the cognitive reserve and use-it-or-lose-it theories, close, supportive relationships provide regular opportunities for meaningful conversation, shared reflection, and emotional validation – all of which are cognitively enriching activities that help stimulate memory-related processes. Conversely, the loss of a spouse through divorce, separation, or death often reduces access to these kinds of emotionally meaningful interactions (14). This may be especially detrimental for older adults, who already have smaller social networks due to health issues or the natural attrition of close ties over time (e.g., through the death of friends or relatives) (103). Emotional support

from a significant other may also encourage better disease management and improve overall quality of life and physical functioning (108). Therefore, emotional support from a spouse is not only comforting in times of hardship but may also protect cognitive health by sustaining the emotional and interpersonal context in which memory thrives.

The stress-buffering hypothesis can also be used to explain the association between marital status and memory. As previously mentioned, stress is often associated with worse cognitive functioning. However, marriage may protect against stress by providing individuals with a consistent source of support, a sense of social integration, and the resources to reframe stressful situations as potentially solvable (104). Indeed, research has shown that married individuals report less distress (104) and greater satisfaction with life (109) than their unmarried counterparts. Conversely, losing a partner through separation, divorce, or bereavement is a stressful experience that may adversely affect health (104). This may ultimately create disparities in cognitive health outcomes between married and unmarried individuals (106).

Lastly, and in line with the social control and social identity theory, the impact of health-promoting behaviours may play a crucial role in the association between marital status and various health outcomes. Marriage may serve as a source of health promotion by encouraging positive health behaviours, ultimately leading to better health outcomes over time (110). More specifically, being married generally encourages a more structured lifestyle, which includes regular meals, sleep, and following recommended health routines, all of which are linked to better health outcomes (104). Furthermore, married individuals are the most likely to engage in proactive health behaviours to prevent illness (110). In addition, spouses may learn from each other and encourage their partners to avoid engaging in risky behaviours such as smoking or excessive drinking, which can ultimately reduce their risk of cognitive decline (104,111). Support from a marital partner may also improve help-seeking behaviours and promote treatment compliance among older adults (112).

In conclusion, the association between marital status and memory may be explained by factors such as material resources, emotional guidance, stress, and health-promoting behaviours. Overall, researchers have proposed that marriage provides unique institutional, economic, and psychosocial benefits that cannot be obtained from other relationships (106).

2.5 FSS, Marital Status, and Memory

Based on the aforementioned literature, the association between FSS and memory may differ depending on one's marital status. More specifically, individuals who are married or in common-law relationships may experience greater positive associations between FSS and memory than those who are not married or living in common-law relationships. This is because a marital partner (and their associated social networks) may provide their spouses with greater emotional guidance and tangible support, in comparison to the potentially distant or irregular sources of support received by unmarried individuals. Therefore, while FSS promotes better memory through stress-buffering mechanisms (11) and other theoretical frameworks (as described above), FSS from a spouse (in addition to FSS from other sources) can generate a greater sense of reassurance, foster more effective coping efforts, and reduce stress during times of physical and mental hardship, which may further enhance memory performance. Since marital status is intertwined with FSS and memory, but is not a mediator because one's perceived level of FSS is unlikely to impact their marital status, studying the role of marital status as an effect modifier of the association between FSS and memory is key to gaining a better understanding of the complex interrelationship between these variables. Previous to this thesis, researchers had not investigated the interrelationship.

To explore previous work on the topic, I undertook a formal systematic review of the literature to accomplish three objectives: (i) report on the current state of scientific knowledge in the area, (ii) identify knowledge gaps in the current state of knowledge, and (iii) devise the research objectives outlined in Section 2.7. This systematic review (19), entitled "*Examining the association between functional social support, marital status, and memory: a systematic review*", was published in BMC Geriatrics on May 12th, 2023 and forms the first academic deliverable of this thesis. No formal systematic review of the literature had ever been conducted on the thesis topic. The review identified knowledge gaps to ensure the thesis would make an original and meaningful contribution to the body of scientific knowledge. The systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (113) and included devising a comprehensive literature search strategy in consultation with a health

sciences librarian, screening articles, and conducting data extraction and risk of bias assessment, all of which were performed by two independent reviewers (114).

The systematic review encompassed the published literature from the inception of PubMed, PsycINFO, and Scopus until June 29th, 2022 (19). I found only four articles that previously explored marital-related variables alongside FSS and memory (13,20–22) (see Appendix A and B for a summary of these findings). In these articles, the source of FSS (i.e., support from spouses versus support from children, family members, and friends), rather than marital status, was used as an effect modifier in the examination of the association between FSS and memory. All four articles reported a mix of cross-sectional and longitudinal secondary analyses from three large panel studies, namely the Health and Retirement Study (HRS) from the United States (115), the English Longitudinal Study of Ageing from England (ELSA) (116), and the PATH Through Life Study from Australia (117).

FSS was measured similarly across the included articles. Liao and Scholes (22), Scholes and Liao (21), and Zahodne et al. (13) assessed FSS with three questions asking participants to indicate the extent to which members of their social networks understood their feelings, could be relied upon to help in times of need, and would be available to serve as good listeners. Windsor et al. (20) defined FSS as ‘positive social exchanges’ and utilized five questions asking about participants’ emotional closeness and dependability on their spouses. On the other hand, each article measured memory differently, both in terms of the type of memory as well as the instrument used for data collection. Liao and Scholes (22) measured memory using time orientation, immediate and delayed recall, and prospective memory tasks. Scholes and Liao (21) measured verbal memory using immediate and delayed recall assessments. Windsor et al. (20) assessed episodic memory with an immediate recall task from the California Verbal Learning Test (68) and working memory with the digits backward sub-test from the Wechsler Memory Scale (67). Zahodne et al. (13) measured episodic memory with the Consortium to Establish a Registry for Alzheimer’s Disease (CERAD) list learning task (118). The findings of each of these articles will be described in further detail in the following sections.

2.5.1 Systematic Review Findings

Windsor et al. (20) conducted latent growth curve analysis and reported positive, though statistically non-significant, correlations between spousal support and both episodic ($r = 0.18$) and working memory ($r = 0.04$), after controlling for age, sex, education, physical functioning, and depressive symptoms. Similarly, positive associations were also found for support from friends (episodic memory: $r = 0.10$; working memory: $r = 0.06$) and family (episodic memory: $r = 0.03$; working memory: $r = 0.07$). However, only the correlation between support from friends and episodic memory was statistically significant. These correlations identify whether participants who began with higher memory scores have a greater or lesser rate of change than those with lower scores over the course of follow-up. After analyzing data at three timepoints over an 8-year period, they found no significant associations between spousal support and changes in both episodic and working memory. No significant associations were also found for support from family and longitudinal changes in episodic and working memory. Of the four included studies, Windsor et al. had the smallest sample size ($n = 1618$), adjusted for the fewest covariates, and included only participants aged 60 to 64 years at baseline. These factors may have led to underpowered analyses that were limited in applicability to a small subset of aging adults. The absence of important covariates, such as income, smoking status, living arrangement, or alcohol consumption, in their regression models could have led to residual confounding.

Scholes and Liao (21) stratified their findings by sex, reporting positive associations between spousal support and verbal memory in men (regression coefficient [β] = 0.07; 95% confidence interval [CI] = -0.03, 0.16), but negative associations in women ($\beta = -0.04$; 95% $CI = -0.13, 0.04$), adjusting for age, wealth, education, smoking and alcohol consumption, physical activity, physical functioning, and depressive symptoms; both of these models did not reach statistical significance. Associations for support from children, friends and family were generally positive and ranged from $\beta = 0.05$ (95% $CI = -0.03, 0.13$) to $\beta = 0.29$ (95% $CI = 0.17, 0.41$), thereby suggesting that spousal support did not confer substantive advantages over support from the other groups. However, negative associations were found between support from family and verbal memory in both sexes (men: $\beta = -0.10$; 95% $CI = -0.21, 0.02$; women: $\beta = -0.03$; 95% $CI = -0.12, 0.08$). The authors also reported positive, though statistically non-significant, associations between spousal support and changes in verbal memory during a 16-year follow-up

for both men ($\beta = 0.02$; 95% $CI = -0.00, 0.04$) and women ($\beta = 0.00$; 95% $CI = -0.01, 0.02$). Positive longitudinal associations of a similar magnitude were also found for support from children, family, and friends. It is important to note that the smaller sample size after stratifying by sex may have limited statistical power to detect significant associations in the female or male subgroups. Additionally, treating marital status as a dichotomous variable may have obscured important differences between widowed, single, separated, and divorced individuals within the 'unmarried group'. Furthermore, including unmarried/unpartnered individuals in the analysis, but assigning them a score of zero for spousal support, may have biased the analyses involving spousal support to the null. Specifically, responses for the spousal support variable ranged from 0 (not at all) to 3 (a lot). However, all unmarried individuals received a score of 0, as did married individuals who rated their spousal support very low. As a result, the number of zero responses for this variable was inflated by the large number of individuals in the unmarried group, which likely led to an underestimate of the effect of spousal support on the outcome.

Zahodne et al. (13) found spousal support to be positively associated with episodic memory ($\beta = 0.02$; 95% $CI = 0.00, 0.05$) when compared to support from children ($\beta = 0.00$; 95% $CI = -0.02, 0.03$), family ($\beta = -0.03$; 95% $CI = -0.05, -0.01$), and friends ($\beta = 0.00$; 95% $CI = -0.02, 0.02$), adjusting for age, gender, race, education, baseline assessment wave, depression, chronic health conditions, and self-rated health. However, the model including support from family was the only one that reached statistical significance. In addition, negative associations were reported between spousal support and changes in episodic memory during a 6-year follow-up ($\beta = -0.02$; 95% $CI = -0.10, 0.07$). This result was not substantively different relative to support from children ($\beta = 0.00$; 95% $CI = -0.07, 0.07$) or family members ($\beta = 0.03$; 95% $CI = -0.04, 0.09$). Support from friends was also negatively associated with longitudinal changes in memory ($\beta = -0.06$; 95% $CI = -0.12, 0.00$). None of the longitudinal results in this study were statistically significant. However, their analytical sample was restricted to individuals who were married or partnered ($n = 7142$), thereby limiting their findings to solely these individuals. In addition, the sample size may have been insufficient to achieve adequate statistical power. Despite adjusting for multiple covariates, the possibility of residual confounding remains, particularly given their exclusion of any lifestyle-related covariates (e.g., smoking status or alcohol consumption) that may influence both FSS and memory.

Liao and Scholes (22) reported that greater social support from a spouse/partner was significantly associated with lower baseline memory ($\beta = -0.06$; 95% $CI = -0.09, -0.03$) among women, after controlling for age, sex, socioeconomic status, health factors, mobility limitations, and depressive symptoms. Negative associations of a similar magnitude were also found for support from children in women and support from family members in both men and women, though only the model including support from family in men was statistically significant. Conversely, spousal support in men ($\beta = 0.02$; 95% $CI = -0.02, 0.05$) was positively associated with baseline memory. Similar positive associations were also reported for support from children in men and support from friends in both sexes, but only support from friends in women was statistically significant. In terms of their longitudinal findings, the authors reported greater social support from a spouse/partner was significantly associated with slower memory decline over an 8-year period for both sexes (men: $\beta = 0.01$; 95% $CI = 0.00, 0.01$; women: $\beta = 0.01$; 95% $CI = 0.00, 0.02$). Positive associations of a similar magnitude were also found between memory decline and support from children, family, and friends. Although this study was the only one to report statistically significant associations between spousal support and memory, several methodological limitations must be acknowledged. For instance, similar to the other study by these same authors (21), marital status was considered a dichotomous variable and individuals without a spouse or partner were included in the analysis and assigned a score of zero for spousal support.

Taken together, across all four articles, cross-sectional and longitudinal findings generally showed positive associations between FSS from a spouse/partner and memory, especially when the results were stratified by sex. However, effect sizes were small and often nonsignificant, and none of these four studies included sample size calculations. The effect sizes for spousal support were also comparable to other sources of support, including children, relatives, and friends. Thus, one cannot conclude from the existing evidence whether support from spouses was more effective than support received from other sources. Also, none of the articles specifically explored the impact of marital status on the association between FSS and memory.

2.5.2 Updated Literature Search

Using the same search strategy as the previously mentioned systematic review (19), an updated literature search was conducted on May 27th, 2025. No articles specifically answering this research question were found to have been published. However, one study by Lee and Jiang (119) investigated whether an interaction existed between FSS and widowhood status on memory performance in a sample of 2515 older adults aged 60 years or older. This study utilized secondary data from the Population Study of Chinese Elderly in Chicago (PINE) (120,121). The authors used two timepoints of data and restricted their sample to individuals who identified as either married or widowed at the first time point; participants who indicated that they were divorced, separated, or never married at the first timepoint were excluded. Widowhood status was categorized based on the following distinctions: (1) married – married at both timepoints; (2) recently widowed – married at baseline but widowed at follow-up; and (3) previously widowed – widowed at both timepoints. FSS was measured similarly to the four studies mentioned above, while episodic memory was measured by combining the immediate and delayed recall components of the East Boston Memory Test (66). Overall, the authors reported that the interaction between FSS and recent widowhood was positive ($\beta = 0.01$; 95% $CI = -0.10, 0.11$), whereas the interaction between FSS and previous widowhood on episodic memory was negative ($\beta = -0.01$; 95% $CI = -0.04, 0.03$). However, none of these associations were statistically significant at the 5% level. A summary of this study was also added to Appendix B.

2.6 Conclusion

In conclusion, this thesis was undertaken to explore the impact of marital status on the association between FSS and memory, which is supported by theories such as the stress-buffering hypothesis. More specifically, the frequent and regular interactions between spouses in married or common-law relationships can provide a steady source of FSS, which in turn may ameliorate life stressors and protect against memory decline.

Despite the theoretical rationale supporting the role of marital status as an effect modifier of the association between FSS and memory, this relationship has been understudied in the literature, leading to gaps that are addressed with the thesis. Interestingly, most articles that

examined the association between FSS and memory, while simultaneously considering marital-related variables, did not find any significant associations between social support from a spouse/partner and memory. These nonsignificant findings may be indicative of problems with power or sample size rather than a valid reflection of the impact of marital status specifically. Furthermore, most articles dichotomized marital status into either married/partnered or unmarried/unpartnered. The unmarried group encompassed all individuals who were single, never married, divorced, separated, or widowed. However, widowed, divorced, or separated individuals may share very diverse and unique experiences compared to those who were never married due to the grief and stress associated with losing a loved one or the dissolution of a long-term relationship. Therefore, such categorizations in the literature may have obscured important inter-group differences among the non-married group. On the other hand, the study by Lee and Jiang (119) excluded divorced, separated, and single individuals from their analysis altogether, which precluded drawing inferences about how FSS may impact memory differently for individuals in these groups. Given the distinct experiential nature of each marital group, a key direction for research is to examine how different types of marital status may impact the association between FSS and memory, as this may offer valuable insights into the effect of relationship dynamics on relations between social determinants of health and cognitive function.

To address these knowledge gaps—including the all-encompassing unmarried category, the potential for residual confounding, small sample sizes, and the lack of examining marital status specifically as an effect modifier—this sequential explanatory mixed methods thesis investigated the association between FSS and memory using data from individuals of different marital status groups. The current study is not only the first to examine the role of marital status as an effect modifier of the association between FSS and memory, but it accomplishes this aim using longitudinal data from the CLSA. The use of quantitative data from a large-scale study has several advantages, including a larger sample size to permit stratification by multiple marital status groups and the availability of a greater number of covariates to address confounding. In addition, for the qualitative portion of the thesis, individuals who resemble the CLSA sample were interviewed to help interpret the quantitative findings, which is important given the foundational nature of the thesis topic.

2.7 Research Objectives and Hypotheses

To comprehensively understand and examine the association between FSS, marital status, and memory, this thesis employed a sequential explanatory mixed-methods study design to address the following research objectives:

- 1) Quantitative phase: Examine whether marital status acts as an effect modifier of the association between FSS and memory in middle-aged and older, community-dwelling adults in Canada;
- 2) Qualitative phase: Explain and contextualize the findings from objective #1 above by conducting interviews with a sample of persons who reflect the characteristics of the quantitative sample.

I hypothesized that marital status would serve as an effect modifier of the association between FSS and memory. More specifically, I predicted that individuals who are married or in common-law relationships would report stronger positive associations between FSS and memory than widowed, divorced, separated, or single individuals. The research undertaken to explore the two objectives and the hypothesis has yielded two peer-reviewed publications: (a) a systematic review to identify knowledge gaps and set the context of the thesis (19), and (b) the presentation of results from the quantitative phase of the thesis (122). A third manuscript detailing the qualitative findings is under submission. The methods underlying the quantitative and qualitative portions of the thesis are presented in Chapter 3 and the results are presented in Chapters 4 and 5.

Chapter 3

Methods

3.1 Phase 1 (Quantitative Study)

3.1.1 Background

All analyses for the quantitative study were conducted using secondary data from three timepoints of the Canadian Longitudinal Study on Aging (CLSA) (123). The CLSA is a national, population-based, panel study designed to examine the impact of biopsychosocial factors on the health of middle-aged and older adults. The CLSA is comprised of two groups: the Tracking and Comprehensive Cohorts. All participants in the Tracking Cohort provided data via a 60–90 minute telephone interview (123). The second component of the CLSA, the Comprehensive Cohort, randomly recruited 30,097 participants spread across 7 provinces. Unlike the Tracking Cohort, Comprehensive participants provided data through in-home and in-person interviews. All analyses for the quantitative portion of this thesis used data from the Tracking Cohort of the CLSA.

3.1.2 Study Design

Using stratified random sampling, the Tracking Cohort recruited 21,241 community-dwelling participants between the ages of 45 and 85 years at baseline across the 10 Canadian provinces, with 17,052 and 14,848 participants remaining in the study and providing data at the first and second follow-up timepoints, respectively. On average, each timepoint was spread approximately three years apart (baseline: 2011 to 2015; follow-up 1: 2015 to 2018; follow-up 2: 2018 to 2021).

Tracking Cohort participants were recruited from three sources: (1) provincial healthcare databases, (2) random digit dialing (RDD) of landline telephones, and (3) the Canadian Community Health Survey (CCHS) on Healthy Aging (124). Participants were randomly recruited into strata based on their province of residence, age group, and sex. After observing that predominantly highly educated persons were being recruited into the study, the CLSA investigators added another stratum for education in the later stages of recruitment to increase the

recruitment of participants with lower educational attainment. Further information about the CLSA's design and sampling process is available elsewhere (125).

Persons were eligible to join the CLSA if they were between the ages of 45 and 85 years at baseline, understood English or French, and resided in one of the ten Canadian provinces. Individuals were excluded from the CLSA if they showed signs of overt cognitive impairment at the recruitment interview. This measure was taken to ensure that participants could provide valid data and comprehend the informed consent process, particularly since the CLSA aimed to follow as many participants as possible over a 20-year period. Additional exclusion criteria included residing in a long-term care facility, Canadian territory or First Nations reserve, as well as being a full-time member of the Canadian Armed Forces.

The current thesis only used data from the CLSA's Tracking Cohort for three reasons. First, the Tracking Cohort had a broader sampling frame than the Comprehensive Cohort, which recruited participants from a radius of 25 to 50 kilometers around 11 data collection sites. Second, the occurrence of COVID-19 during the second follow-up period greatly impacted data collection for Comprehensive Cohort participants, leading to the cancellation of many in-person interviews and replacement with telephone interviews when possible. For example, 42.5% of the Comprehensive Cohort participants' data collection site visits ($n = 10,839$) at the second follow-up were conducted over the telephone. In comparison, only 2.9% ($n = 813$) of the data collection site visits were undertaken by telephone at the first follow-up. Third, the Rey Auditory Verbal Learning Test (RAVLT) – the measure of memory used in the thesis – is sensitive to whether it is administered over the telephone (Tracking) or in person (Comprehensive) (126), thereby arguing against combining the results of memory test scores from both cohorts into a single analysis.

Ethics approval for the quantitative study was obtained from the University of Waterloo's Office of Research Ethics (file #44539). Access to the Tracking Cohort dataset was approved by the CLSA's Data and Sample Access Committee (access #2209003).

3.1.3 Measures

Functional Social Support (FSS): FSS was measured using the 19-item Medical Outcomes Study – Social Support Survey (MOS-SSS) (26). The survey asks participants to estimate the extent to which they may draw upon four subtypes of FSS – positive social interactions, and affectionate, tangible, and emotional/informational support – from members of their social network (26). Each question on the MOS-SSS consists of five response options ranging from 1 = "none of the time" to 5 = "all of the time". All 19 items were used to derive scores for overall FSS; these items were also grouped to derive scores for each of the four FSS subtypes (see Appendix C). Scores for overall FSS and each subtype were treated as continuous variables, ranging from 1 to 5. The MOS-SSS demonstrates excellent psychometric properties for use in clinical research, especially among older populations (127).

Memory: Participants' immediate and delayed recall memory were measured using a modified version of the RAVLT (65). The CLSA's Psychology Working Group modified the RAVLT to fit within the time constraints of the data collection interviews. The modifications included using only one of the five learning trials in the RAVLT and administering the delayed recall test after five minutes instead of 20 to 45 minutes. The working group then tested the modifications to verify the measure's validity in the CLSA (5). Means and standard deviations of RAVLT scores in the CLSA data were compared with those from previous studies involving a similar cohort of healthy adults aged 45 to 85 years with large sample sizes. From these preliminary analyses, it was observed that the performance of CLSA participants on the RAVLT was generally similar to that observed in earlier studies conducted in both English and French.

In the modified RAVLT, participants listened to a recorded list of 15 words (see Appendix D) and were asked to immediately recall as many of the words as possible within 90 seconds. Five minutes later, participants were asked to recall as many of the same words as possible, within 60 seconds, without hearing the list again. Each word recalled correctly was awarded one point; each acceptable variant word (a word sounding like the word used in the recording – e.g., "collar" vs. "colour") was also awarded one point if used in both the immediate and delayed recall tests. Raw scores for each administration ranged from 0 to 15.

The raw scores were converted into z-scores separately for the immediate and delayed recall administrations. Z-scores were also computed separately for English- and French-speaking participants, as language can influence test scores regardless of cognitive function. Therefore, persons with bilingual responses were excluded because it would otherwise be unclear which z-score to apply in the case of persons who responded in both languages. For each language, the mean (m) and standard deviation (s) of the immediate and delayed recall raw scores were obtained from the cognitively healthy subsample of participants, which included individuals who did not report having a cognitive disorder such as Alzheimer's disease, Parkinson's disease, epilepsy, multiple sclerosis, a cerebrovascular accident, memory problem, traumatic brain injury, transient ischemic attack, or stroke. These summary statistics were used to compute z-scores using the following formula: $(\bar{x} - m)/s$, where $\bar{x}$ was the raw score for each participant. The z-scores for the immediate and delayed recall administrations were then added together to obtain a single memory score for each participant. The RAVLT demonstrates good validity and reliability (128) and has been used extensively in older populations (16,129,130).

Marital Status: Participants answered the following question – “*What is your current marital/partner status?*” – with one of five response options: single, married or living with a partner in a common-law relationship, widowed, divorced, or separated. To ensure adequate statistical power, I followed Han et al.'s approach (131) and re-categorized the response options into: (1) married or living in a common-law relationship, (2) single, and (3) widowed, divorced, or separated.

Other Covariates: Data from the following 11 covariates were included in the regression analysis based on the articles included in the previously mentioned systematic review by Haghighi and Oremus (19), as well as the broader literature on FSS and memory (8,10,13,24,25): (1) sociodemographic variables (sex, age group, education, annual household income, province of residence, and living arrangement), (2) health variables (chronic conditions, functional status/activities of daily living, and depressive symptoms), and (3) lifestyle factors (smoking status and alcohol consumption). Guided by CLSA recommendations, participants' sex, baseline age group, and province of residence were included as variables in all regression models to account for the complex survey design (132).

All covariates were treated as categorical variables for several reasons. Age was grouped into four categories to align with the CLSA's recruitment strata, whereas many other covariates (e.g., sex, province, income, education, smoking status, and alcohol consumption) were already in categorical format in the questionnaires. Furthermore, categorizing depression and functional status was necessary to implement the missing data category approach used in the sensitivity analysis (see Section 3.1.5 below), which would not have been possible with continuous variables. Full descriptions of all covariates are provided in Appendix E. The CLSA's questionnaires are also available online (133).

3.1.4 Statistical Analyses

Descriptive statistics were computed for all variables. Categorical variables were examined using frequencies and percentages, whereas continuous variables were examined with means and standard deviations (if normally distributed), or medians and interquartile ranges (if non-normally distributed). All analyses were conducted on unweighted data because the CLSA's weights do not account for missing data.

The analysis drew upon all the data available at the CLSA's baseline, follow-up 1, and follow-up 2 timepoints. Only individuals with complete data on FSS, marital status, memory, and all covariates at each timepoint were included in the main analysis. The PROC MIXED procedure in SAS v9.4 (The SAS Institute, Cary, NC) was utilized to run a linear mixed effects model with a random intercept and a random time effect. The analysis followed these steps: memory was regressed on FSS in a base model adjusting for age group, sex, and province of residence; this model was then re-run with an FSS*marital status interaction. In addition, a fully adjusted model was developed, adjusting for all pre-specified covariates; this model was also re-run with an FSS*marital status interaction.

The Akaike information criterion (AIC) was used to assess model fit and different correlation structures (e.g., unstructured, exchangeable, and autoregressive correlation) were tested when fitting the base model. The correlation structure that yielded the lowest AIC was used in all subsequent analyses. A likelihood ratio test was employed to compare the models

with and without the FSS*marital status interaction. A significance level of 0.05 was set for all statistical tests.

3.1.5 Sensitivity Analyses

Missing values ranged from 0.0001% (smoking status at follow-up 1) to 31.7% (smoking status at baseline). There was no missing data for variables such as sex, age group, province, or living arrangement. Therefore, in addition to the complete case analysis, sensitivity analyses were conducted to examine whether the findings from the regression analyses described above changed after including individuals with missing data on the covariates. Different strategies for addressing this missing covariate data were considered. More specifically, the complete case analysis was compared to two approaches:

1) Multiple imputation: this method was employed to impute missing covariate values using the ‘mice’ package in R statistical software (134). Prior to conducting the imputation, it was assumed that the missingness in our dataset was missing at random (MAR), a condition of the multiple imputation approach. Variables with no change (e.g., education) or minimal changes (< 2%) across all three timepoints (e.g., income) were imputed using the classification and regression trees (CART) imputation method. The CART method was chosen because it is more robust, especially for complex datasets with different types of missingness and variable types, compared to other approaches such as predictive mean matching (PMM). The fully conditional specification (FCS) approach was used to impute missing values for the remaining variables in the longitudinal setting (e.g., smoking status, alcohol consumption, chronic conditions, functional status, and depressive symptoms). A series of multi-level mixed effects models were specified for each variable, with its distribution conditioned on all other variables in the dataset (135). Each mixed-effect model accounted for between-subject heterogeneity by including subject-level random effects and a variance-covariance matrix. This method has demonstrated superior predictive performance compared to other linear mixed effects-based imputation techniques. Twenty-two imputation cycles were conducted, each producing one dataset. Separate regression models were then created for each of the 22 imputed datasets and Rubin’s rules (136) were used to combine the results into a single set of regression coefficients.

2) Missing data category: an additional category called ‘missing data’ was created for each covariate with missing data values. For instance, smoking status is a three-level variable: 0 = never smoked, 1 = occasional smoker, and 2 = daily smoker. In the ‘missing data category’ approach, participants with missing data on this variable were coded as ‘3 = missing data’ and retained in the analysis.

Any individuals with missing data on FSS, marital status, or memory were excluded from the analyses described above. Since imputing missing data involves assumptions about the nature of the missingness (e.g., MAR), and these assumptions are difficult to verify, we adopted a conservative approach and avoided imputing data for the three variables that were central to our research objectives. All regression models were re-run with the multiple imputation and missing data category approaches; results were compared to the findings from the complete case analysis.

Considering that most participants did not change their marital status over the three timepoints, another sensitivity analysis was conducted to compare whether the association between FSS and memory changed after stratifying our sample by their baseline marital status (instead of including a FSS*marital status interaction in the model). Within each marital status stratum, I re-ran both the base and fully adjusted regression models outlined above and utilized Cuzick’s graphical forest plot method (137) to assess the presence of effect modification.

3.2 Phase 2 (Qualitative Study)

I conducted a qualitative study to add a greater depth of understanding to the findings from the quantitative analysis. In this study, I recruited a group of middle-aged and older adults whose age characteristics mirrored the CLSA sample. The intent was to use the real-life experiences of these individuals to help explain the quantitative findings. Given the dearth of research on whether marital status affects the association between FSS and memory, I hoped the engagement of key informants could help interpret and contextualize the findings to provide a more expansive understanding of an understudied area.

Since the intent of drawing on a mixed methods approach was to give middle-aged and older adults an opportunity to aid in interpreting and contextualizing the quantitative findings, the pragmatic paradigm guided this qualitative study. This paradigm emphasizes that one’s

research approach is chosen because it is the best-suited means of generating knowledge about a given topic (138). The pragmatic paradigm is often associated with mixed-methods research, as it is rooted in using pluralistic approaches to address a research problem, thereby allowing researchers to draw from both quantitative and qualitative methods (139). This paradigm supports the researcher in employing both quantitative and qualitative methods to gain a more comprehensive understanding of the research topic. More specifically, given that this is an understudied area, our interpretations of the quantitative findings may be limited by the small body of existing literature. Thus, conducting a qualitative study may help to broaden interpretations by capturing the voices and perspectives of individuals similar to the study population, which quantitative data alone may not reveal.

3.2.1 Study Design

One-on-one, semi-structured interviews were conducted with 18 community-dwelling adults between the ages of 45 and 85 years. The interviewees were not part of the CLSA sample, as the CLSA does not release participants' contact details. Rather, they were recruited via purposive sampling to reflect the age and sex characteristics of CLSA participants. More specifically, participants were considered for inclusion if they were community-dwelling adults between the ages of 45 and 85 years, were fluent in English, and did not display any overt signs of cognitive impairment. In this study, cognitive impairment referred to any participant exhibiting apparent problems with cognitive ability that may have influenced their ability to provide informed consent or understand study procedures (e.g., difficulty following a conversation, understanding the purpose of the interview, or providing basic demographic information).

Snowball sampling, posters, social media posts and advertisements were used to recruit participants. Study materials were distributed to various organizations across Ontario, such as the K-W Seniors Day Program (140), University of Waterloo CUPE 793 workers union, Seniors Learning in Retirement (SLR) London (141), Donya's Pharmacy (142), Forest Heights Library, Grand River Library, and McMaster Institute for Research on Aging (143). Advertisements were also displayed in Coffee News magazine (144) and a Faculty of Health newsletter. Interested

individuals were asked to contact the thesis candidate, by phone or email, if they wished to participate in the current study.

During the initial contact with a participant, the thesis candidate provided further details about the study and asked preliminary screening questions regarding marital status, age, sex, and educational level. This was done to ensure that participants represented a diverse range of marital statuses and met the eligibility criteria for the qualitative study. Once screened, potential participants were sent an information package and consent form to review and sign (see Appendix F and G).

Once informed consent was obtained, I scheduled a mutually convenient time to conduct the interview. All interviews took place on the Zoom video-conferencing platform and ranged from 20 to 60 minutes. Participant recruitment continued until at least one or two participants were represented from each marital status category and the data reached thematic saturation, which occurred when further interviews did not yield any new codes or themes on the topic under investigation (145). Ethics approval for the qualitative study was obtained from the University of Waterloo's Office of Research Ethics (file # 45801).

3.2.2 Interview Process

All interviews began by asking participants about the types and sources of social support they receive, their marital history, and memory function. I served as the interviewer and probed with follow-up questions when necessary. The interview guide was finalized once the quantitative analysis was complete, given that some of the interview questions emerged from the quantitative findings. The full interview guide can be found in Appendix H.

Throughout the interviews, I aimed to maintain a reflexive position, which means I actively considered how my personal background and expertise might affect elements of the research process, such as ranking the importance of themes or providing lay-language descriptions of concepts and definitions to participants. For instance, I recognize that I am married, which may have shaped my understanding of marital experiences. However, the current study included participants with a diverse range of marital statuses, including divorced, common-law, single, and widowed individuals. Additionally, I am not a middle-aged or older adult, which

means I may not share the direct lived experience of the participants in this group. Thus, throughout the data collection process, I made conscious efforts to be mindful of these differences and avoid making assumptions about the participants' experiences by asking them to elaborate on specific concepts (e.g., marital dissolution or aging), encouraging them to share their personal perspectives in depth. This approach allowed for a richer understanding of their unique experiences and helped ensure that their voices were heard without being unduly influenced by my own background or assumptions. I continually reflected on my role as a researcher and sought to maintain an open, empathetic stance throughout the interviews, recognizing the value of each participant's narrative and the diversity of experiences within the broader context of social relationships in older adulthood.

3.2.3 Qualitative Analyses

Each interview was audio-recorded and transcribed verbatim using the Zoom platform's built-in tools (v6.1.11, Zoom Video Communications, San Jose, CA). After transcription, each interview was checked for accuracy by re-listening to the audio recording and cross-referencing it with the written transcript. Pseudonyms were used in all the interview transcripts to protect the privacy of participants. The transcripts were imported into NVivo software (v15.1.0, Lumivero, Denver, CO) and organized by question. Reflexive thematic analysis (146,147) was used to identify recurrent and overarching themes about how marital status might influence the association between FSS and memory. Themes were developed through a multi-step process. First, each transcript was read one-by-one, noting any comments by the participant that appeared to address the study objectives. Similar comments were tagged with short descriptors in a process called coding. Each code bound together similar sets of comments to identify different explanations as to how marital status may or may not influence the association between FSS and memory. Codes were derived inductively, meaning that I did not attempt to validate any preconceived theories surrounding the association between FSS, marital status, and memory (146). Instead, codes were derived from examining the transcripts and codes with similar underlying concepts (e.g., marital quality, marital satisfaction, and marital history) were merged to produce overarching themes. In some cases, participants described experiences that aligned

with certain concepts without explicitly naming them. For example, statements about “seeking advice” or “needing someone to listen” were coded as *informational support*. This reflects a form of conceptual coding, where underlying themes are identified even when not directly articulated. A deeper, reflexive analysis was required to recognize these subtle expressions and connect them to relevant theoretical concepts. Throughout the process, I remained attuned to these nuances, revisiting the data multiple times, considering the context and language used, and reflecting on how these implicit concepts informed the themes that emerged from the analysis.

No clear consensus exists among qualitative researchers about whether a single coder or multiple coders should be employed during the analysis stage. Some argue that multiple coders increase the reliability of the qualitative findings (148). However, others have suggested that the practice of multiple coders was adopted from quantitative research without considering its appropriateness for qualitative research (148). Some approaches to thematic analysis, such as reflexive thematic analysis (the method used in the thesis), embrace researcher subjectivity as a valuable resource and view the coding process as inherently subjective, thereby rejecting the notion that coding can ever be accurate (149). In addition, some researchers argue that the use of a second coder could lead to simplistic coding and superficial analyses, risking the loss of richness in the data (150). This may especially be the case if the second coder was not involved in all the interviews or does not have the same insight or depth of knowledge about the research topic to code highly nuanced interview transcripts, which are more challenging to code consistently (150). Braun and Clarke (146) argue that no singular way exists to conduct thematic analysis, and part of the flexibility of this approach is that it allows researchers to derive themes in various ways, as long as consistency is maintained throughout the analytical process. Taken together, while second coders can be involved in qualitative analysis, no specific set of best practice guidelines mandates dual coding (e.g., the Consolidated Criteria for Reporting Qualitative Research (COREQ) (151)); thus, this may not be appropriate for the reflexive thematic analysis undertaken in this thesis. For these reasons, I served as the sole coder for all the interviews.

3.3 Integrating the Quantitative and Qualitative Studies

The integration of the quantitative and qualitative studies occurred at three main points of the thesis: (1) after completion of the quantitative analyses; (2) while merging data; and (3) when drawing conclusions.

3.3.1 After Completion of the Quantitative Analyses

The results from the quantitative analyses informed the development of the qualitative interview questions and influenced the sampling methods used to select qualitative participants. For example, purposive sampling was used to ensure that the qualitative sample reflected the demographic diversity present in the quantitative data, aligning closely with the age and sex distribution of the CLSA sample. Additionally, I aimed to include at least one or two participants from each marital status category to gather insights into the experiences of individuals with various marital histories. This approach helped to understand the complex contexts surrounding how different marital statuses might differentially affect FSS and memory function. Furthermore, the approach helped identify key variables in the association that may not have been examined or identified in the quantitative analysis or previously published studies.

3.3.2 Merging Data

Integration also occurred during the comparison of the quantitative and qualitative results to identify any convergences, divergences, and contradictions between the two data sources. For instance, I examined specific codes that emerged from the qualitative data (e.g., stress, memory tools, marital quality, length of relationship) to see how they related to the experiences of FSS and their association with memory performance. From this analysis, overarching themes were developed that explained the nature and underlying mechanisms behind the associations between FSS, marital status, and memory, thereby deepening the understanding of the quantitative findings. This integration was then visually represented through a joint display diagram (see Chapter 6). This diagram is a method used to link qualitative and quantitative data by presenting them together side-by-side in a table or graphical format (152). Many sequential explanatory

mixed methods studies have used joint displays to illustrate how certain themes from the qualitative analysis may be used to explain the relationship between variables in the quantitative analysis (152).

3.3.3 Drawing Conclusions

Lastly, integration occurred during the discussion phase of the thesis. I used the qualitative data to help explain why the relationship between FSS and memory was not modified by marital status in the quantitative analysis. Based on this integrated understanding, informed recommendations were made for policy, practice, and future research.

Chapter 4

Quantitative Results

The Tracking Cohort consisted of 14,658 participants who provided data at baseline, follow-up 1, and follow-up 2. After excluding individuals with missing data on at least one of FSS, marital status, or memory at any timepoint, a total of 10,318 participants were left in the analytical sample (Figure 1). This sample was used for the regression models in both the multiple imputation and missing data category sensitivity analyses. However, for the complete case analysis, another 5,964 participants were removed from the analytical sample because they had missing data on at least one covariate. Therefore, the sample size for the complete case analysis was 4,354.

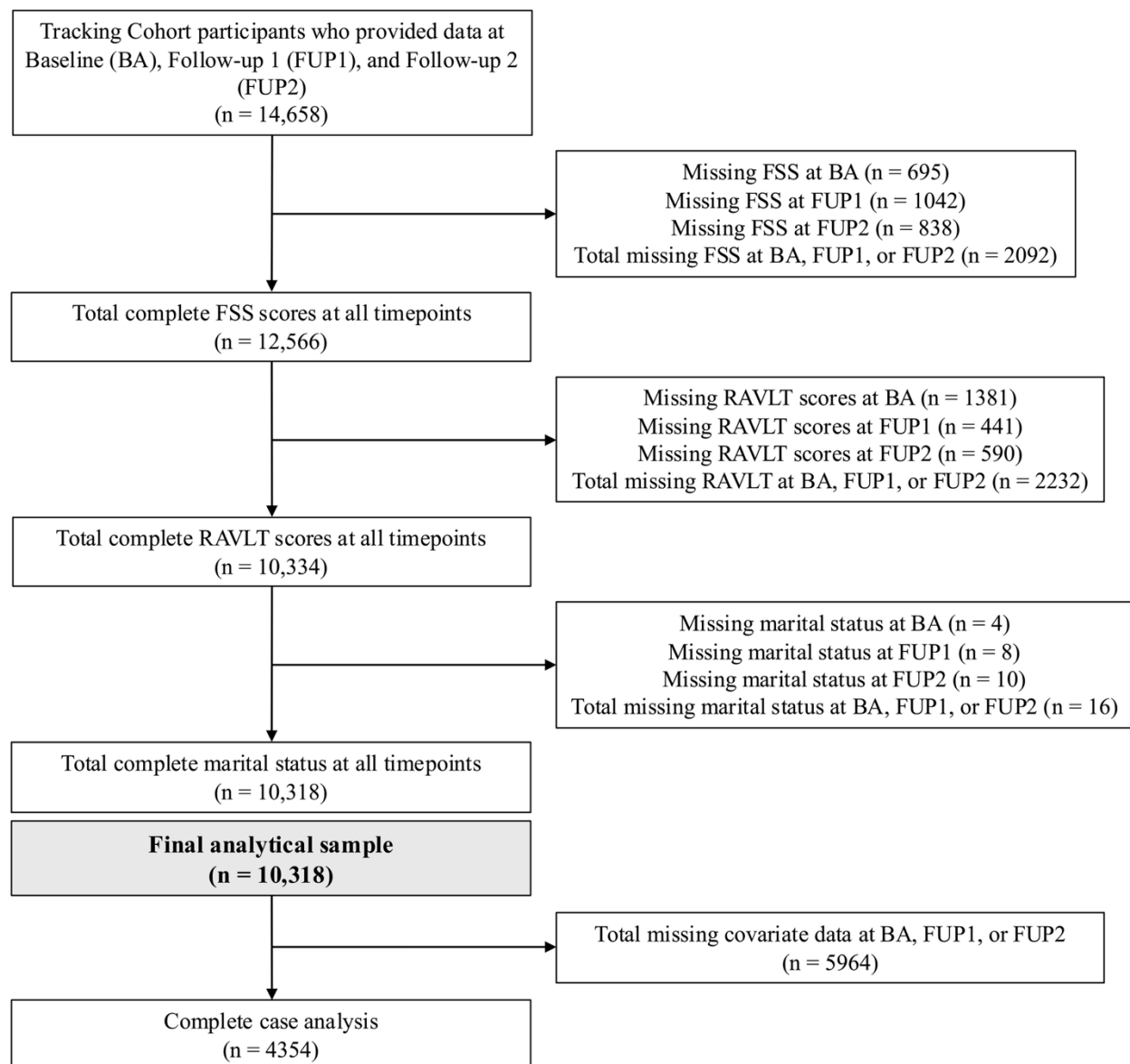


Figure 1. Flowchart of the Analytical Sample

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770. <https://doi.org/10.1016/j.archger.2025.105770>. © 2025 Elsevier B.V. This is an open-access article under the Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License (<http://creativecommons.org/licenses/bync-nd/4.0/>).

Abbreviations: BA: baseline; FSS: Functional Social Support; FUP1: follow-up 1; FUP2: follow-up 2; RAVLT: Rey Auditory Verbal Learning Test

4.1 Descriptive Analyses

Sociodemographic, health, and lifestyle characteristics of the analytical sample are presented in Table 1. Approximately 52% of the sample was composed of women. About 24% of participants were living in Ontario, followed by 18% in Québec, and 12% in British Columbia. Most participants (81%) had at least some post-secondary education and three-quarters of participants reported annual household incomes of \$50,000 or more. The majority were married or in common-law relationships, while about 80% reported living with at least one other person.

Table 1. Sociodemographic, Health, and Lifestyle Characteristics of the Analytical Sample (n = 10,318)

Characteristics	Baseline n (%)	Follow-up 1 n (%)	Follow-up 2 n (%)
Sex			
Male	4919 (47.7)	4928 (47.8)	4919 (47.7)
Female	5399 (52.3)	5390 (52.2)	5399 (52.3)
Age Group			
45-54 years	3333 (32.3)	1565 (15.2)	553 (5.4)
55-64 years	3633 (35.2)	3819 (37.0)	3702 (35.9)
65-74 years	2159 (20.9)	3110 (30.1)	3592 (34.8)
75 years and older	1193 (11.6)	1824 (17.7)	2471 (24.0)
Province			
Alberta	1018 (9.9)	1020 (9.9)	1026 (9.9)
British Columbia	1226 (11.9)	1252 (12.1)	1265 (12.3)
Manitoba	656 (6.4)	639 (6.2)	639 (6.2)
New Brunswick	642 (6.2)	645 (6.3)	643 (6.2)
Newfoundland & Labrador	559 (5.4)	546 (5.3)	541 (5.2)
Nova Scotia	793 (7.7)	805 (7.8)	808 (7.8)
Ontario	2442 (23.7)	2452 (23.8)	2456 (23.8)
Prince Edward Island	548 (5.3)	535 (5.2)	527 (5.1)
Quebec	1841 (17.8)	1842 (17.9)	1840 (17.8)
Saskatchewan	593 (5.8)	582 (5.64)	573 (5.6)
Education			
Less than high school	594 (5.8)	594 (5.8)	594 (5.8)
High school diploma	1304 (12.6)	1304 (12.6)	1304 (12.6)
Some post-secondary education	728 (7.1)	728 (7.1)	728 (7.1)
Post-secondary diploma/degree	7663 (74.3)	7663 (74.3)	7663 (74.3)
<i>Missing</i>	29 (0.3)	29 (0.3)	29 (0.3)
Annual Household Income			
≤ \$19,999	374 (3.6)	371 (3.6)	357 (3.5)
\$ 20,000 – 49,999	2400 (23.3)	2363 (22.9)	2454 (23.8)
\$ 50,000 – 99,999	3757 (36.4)	3715 (36.0)	3531 (34.2)
\$ 100,000 – 149,999	1897 (18.4)	1865 (18.1)	1793 (17.4)

≥ \$ 150,000	1404 (13.6)	1452 (14.1)	1409 (13.7)
<i>Missing</i>	486 (4.7)	552 (5.4)	774 (7.5)
Marital Status			
Married or common-law	7736 (75.0)	7607 (73.7)	7425 (72.0)
Widowed, divorced, or separated	1862 (18.1)	1970 (19.1)	2200 (21.3)
Single	720 (7.0)	741 (7.2)	693 (6.7)
Living Arrangement			
Alone	1829 (17.7)	2081 (20.2)	2300 (22.3)
With others	8489 (82.3)	8237 (79.8)	8018 (77.7)
Chronic conditions			
No chronic condition	1061 (10.3)	672 (6.5)	0 (0.0)
One or more conditions	9234 (89.5)	9633 (93.4)	8184 (79.3)
<i>Missing</i>	23 (0.2)	13 (0.1)	2134 (20.7)
Functional Status			
No functional impairment	825 (8.0)	1009 (9.8)	1276 (12.4)
Mild impairment	9322 (90.4)	8851 (85.8)	8609 (83.4)
Moderate impairment	107 (1.0)	190 (1.8)	233 (2.3)
Severe or total impairment	44 (0.4)	88 (0.9)	145 (1.4)
<i>Missing</i>	20 (0.2)	180 (1.7)	55 (0.5)
Depressive Symptoms			
Score of < 10	8696 (84.3)	8541 (82.8)	8876 (86.0)
Score of ≥ 10	1442 (14.0)	1576 (15.3)	1258 (12.2)
<i>Missing</i>	180 (1.7)	201 (2.0)	184 (1.8)
Smoking Status			
Never smoker	6200 (60.1)	9595 (93.0)	9676 (93.8)
Occasional smoker (at least one cigarette in the past 30 days)	173 (1.7)	191 (1.9)	145 (1.4)
Daily smoker (at least one cigarette per day for the past 30 days)	677 (6.6)	531 (5.2)	493 (4.8)
<i>Missing</i>	3268 (31.7)	1 (0.0)	4 (0.0)
Alcohol Use			
Never	1028 (10.0)	997 (9.7)	1701 (16.5)
Less than once per month	1501 (14.6)	1410 (13.7)	1371 (13.3)
1-3 times per month	1921 (18.6)	1895 (18.4)	1781 (17.3)
1 or more times a week	5572 (54.0)	5684 (55.1)	5431 (52.6)
<i>Missing</i>	296 (2.9)	332 (3.2)	34 (0.3)

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, Archives of Gerontology and Geriatrics, 131, 105770.

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4.1.1 Distribution of FSS

Descriptive results for overall FSS and each subtype at each timepoint are summarized in Table 2. Histograms for each FSS variable at baseline, follow-up 1 and follow-up 2 can also be

found in Figure 2. Overall, participants generally had high scores on FSS at each of the three timepoints, with median scores ranging from 4.5 to 5.0.

Table 2. Distribution of FSS Scores at Baseline, Follow-up 1, and Follow-up 2 (n = 10,318)

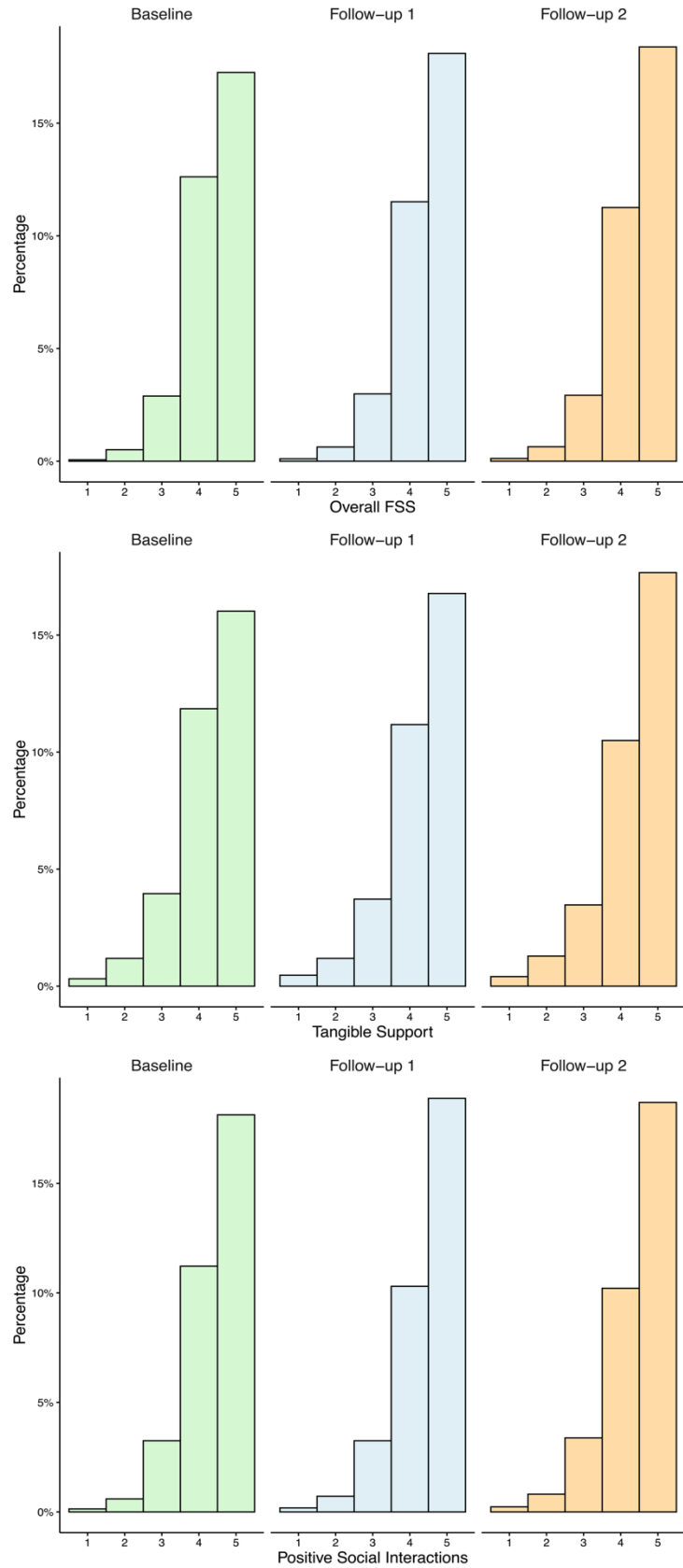
FSS Type	Baseline	Follow-up 1	Follow-up 2
	Median (IQR)	Median (IQR)	Median (IQR)
Overall FSS	4.5 (1.0)	4.6 (1.0)	4.6 (1.0)
TANG	4.5 (1.0)	4.8 (1.0)	4.8 (1.0)
POSINT	4.7 (1.0)	4.7 (1.0)	4.7 (1.0)
EMOINFO	4.5 (1.0)	4.6 (1.0)	4.6 (1.0)
AFF	5.0 (0.7)	5.0 (0.7)	5.0 (0.7)

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770.

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Note. The minimum and maximum values for overall FSS and all subtypes were 1.0 and 5.0, respectively.

Abbreviations: AFF: Affectionate Support; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; IQR: inter-quartile range; POSINT: Positive Social Interactions; TAN: Tangible Support



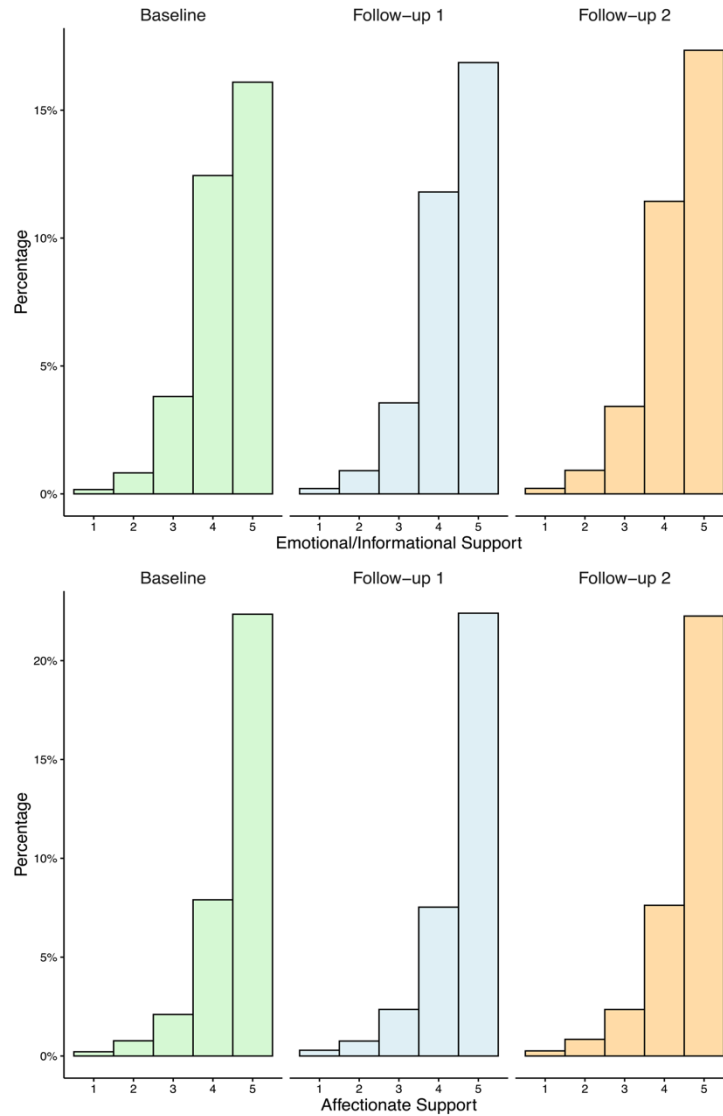


Figure 2. Distribution of FSS Scores (Overall and Subtypes) at Baseline, Follow-up 1, and Follow-up 2

4.1.2 Distribution of Memory Scores

Descriptive results for the combined memory scores at each timepoint are summarized in Table 3. Median memory scores remained relatively stable across the three timepoints, with a slight increase observed between baseline and the first follow-up, before decreasing by the second follow-up. Histograms for the combined memory scores at baseline, follow-up 1, and follow-up 2 can be found in Figure 3.

Table 3. Distribution of Combined Memory Scores at Baseline, Follow-up 1, and Follow-up 2 (n = 10,318)

	Mean (SEM)	Median (IQR)	Minimum	Maximum
Baseline	0.21 (0.02)	-0.14 (2.07)	-4.29	7.92
Follow-up 1	0.13 (0.02)	0.07 (2.45)	-4.37	7.98
Follow-up 2	0.09 (0.02)	-0.02 (2.47)	-4.66	7.94

Abbreviations: IQR: inter-quartile range; SEM: Standard Error of Mean

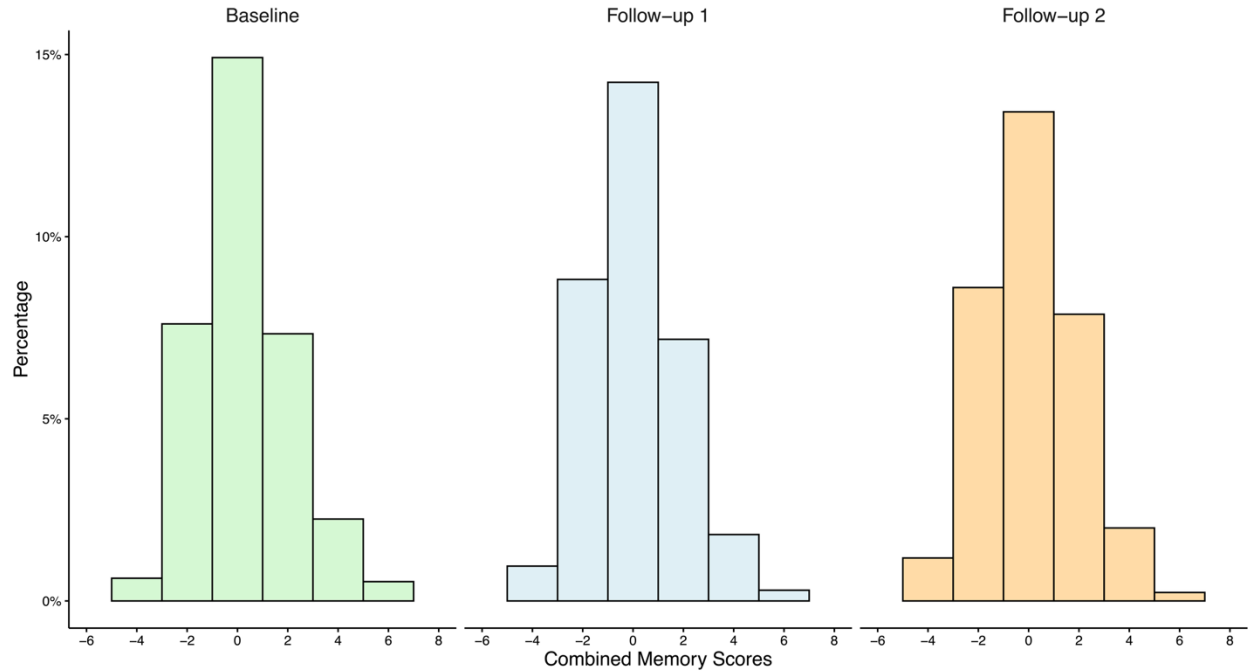


Figure 3. Distribution of Combined Memory Scores at Baseline, Follow-up 1, and Follow-up 2

4.1.3 Distribution of Marital Status

The distribution of participants with changes in marital status across the three timepoints is summarized in Table 4. Marital status remained largely unchanged over the course of follow-up. Overall, 91% reported the same marital status between baseline and follow-up 1, while 95% reported the same marital status between follow-up 1 and follow-up 2 (data not shown).

Table 4. Transitions in Marital Status Across Timepoints (n = 10,318)

	Baseline to Follow-up 1 n (%)	Follow-up 1 to Follow-up 2 n (%)
Married or common-law → married or common-law	7328 (94.7)	7292 (95.9)
Married or common-law → WDS	349 (4.5)	309 (4.1)
Married or common-law → single	59 (0.8)	6 (0.1)
WDS → WDS	1550 (83.2)	1878 (95.3)
WDS → married or common-law	185 (9.9)	79 (4.0)
WDS → single	127 (6.8)	13 (0.7)
Single → single	555 (77.1)	674 (91.0)
Single → married or common-law	94 (13.1)	54 (7.3)
Single → WDS	71 (9.9)	13 (1.8)

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770.

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Note. Marital status at each timepoint reflects participants' current marital status and does not capture the specific timing of transitions between different marital status categories. Since the timepoints are approximately three years apart, participants may have experienced several transitions, such as marriage, divorce, or widowhood, in the interval between the timepoints.

Abbreviations: WDS: widowed, divorced, or separated

The medians for overall FSS and each subtype were significantly different across the various marital status categories (Kruskal-Wallis, $p < 0.001$); these differences were observed at baseline, follow-up 1, and follow-up 2 (Table 5). More specifically, across all three timepoints, individuals who were married or in common-law relationships reported higher scores on overall FSS and each subtype, whereas single individuals had the lowest FSS scores. However, considering scores on the MOS-SSS range from 1 to 5, these between-group differences were minimal and unlikely to be clinically or practically relevant, despite being statistically significant.

Table 5. Distribution of FSS Scores by Marital Status (n = 10,318)

FSS Type	Married or common-law n = 7736	WDS n = 1862	Single n = 720	p-value
	Median (IQR)	Median (IQR)	Median (IQR)	
<i>Baseline</i>				
Overall FSS	4.6 (0.8)	4.2 (1.1)	4.1 (1.3)	<0.001
TANG	4.8 (0.8)	4.0 (1.5)	3.8 (1.8)	<0.001
POSINT	4.7 (1.0)	4.0 (1.3)	4.0 (1.7)	<0.001
EMOINFO	4.6 (1.0)	4.3 (1.3)	4.1 (1.4)	<0.001
AFF	5.0 (0.3)	4.3 (1.3)	4.0 (1.7)	<0.001
<i>Follow-up 1</i>				
Overall FSS	4.7 (0.8)	4.2 (1.2)	4.0 (1.4)	<0.001
TANG	4.8 (0.8)	4.0 (1.5)	4.0 (1.8)	<0.001
POSINT	5.0 (1.0)	4.0 (1.7)	4.0 (1.3)	<0.001
EMOINFO	4.8 (1.0)	4.3 (1.3)	4.0 (1.4)	<0.001
AFF	5.0 (0.3)	4.3 (1.3)	4.0 (1.7)	<0.001
<i>Follow-up 2</i>				
Overall FSS	4.8 (0.8)	4.2 (1.2)	3.95 (1.2)	<0.001
TANG	4.8 (0.8)	4.0 (1.5)	3.75 (1.5)	<0.001
POSINT	5.0 (1.0)	4.0 (1.7)	4.00 (1.3)	<0.001
EMOINFO	4.8 (0.9)	4.3 (1.3)	4.00 (1.4)	<0.001
AFF	5.0 (0.3)	4.3 (1.3)	4.00 (1.7)	<0.001

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, Archives of Gerontology and Geriatrics, 131, 105770.

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Abbreviations: AFF: Affectionate Support; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; IQR: inter-quartile range; POSINT: Positive Social Interactions; TANG: Tangible Support; WDS: widowed, divorced, or separated

Median memory scores increased between baseline and follow-up 1 within each marital status category, but decreased between follow-up 1 and follow-up 2. Memory did not significantly differ between the marital status categories at baseline ($p = 0.46$) or follow-up 1 ($p = 0.09$). However, memory was significantly different across the different marital status categories at follow-up 2 (Kruskal-Wallis test, $p < 0.001$), with WDS individuals displaying the lowest memory scores (Table 6). Similar to the findings for FSS, these between-group differences were minimal and unlikely to be clinically or practically relevant, despite being statistically significant.

Table 6. Distribution of Memory Scores by Marital Status (n = 10,318)

	Married or common-law n = 7736		WDS n = 1862		Single n = 720		
	Median (IQR)	<i>Change scores</i>	Median (IQR)	<i>Change scores</i>	Median (IQR)	<i>Change scores</i>	p-value
Baseline	-0.1 (2.1)	0.2	-0.1 (2.4)	0.1	-0.1 (2.1)	0.2	0.46
Follow-up 1	0.1 (2.4)	-0.1	0.0 (2.5)	-0.4	0.1 (2.4)	-0.1	0.09
Follow-up 2	0.0 (2.4)		-0.4 (2.8)		0.0 (2.8)		<0.001

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, Archives of Gerontology and Geriatrics, 131, 105770.

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Abbreviations: IQR: inter-quartile range; WDS: widowed, divorced, or separated

4.2 Regression Analyses

In the base models, overall FSS and each subtype were positively associated with memory. β s for FSS in the base models ranged from 0.06 to 0.12; the effects of overall FSS and all subtypes were statistically significant at the 5% level (Figure 4; Table 7). However, in the fully adjusted models, only overall FSS, positive social interactions, and affectionate support had statistically significant and positive associations with memory (Figure 5; Table 8). In both the base and fully adjusted models, the estimated effect of overall FSS was larger than any FSS subtype, though I could not draw conclusions about the differences in effect because of overlapping confidence intervals.

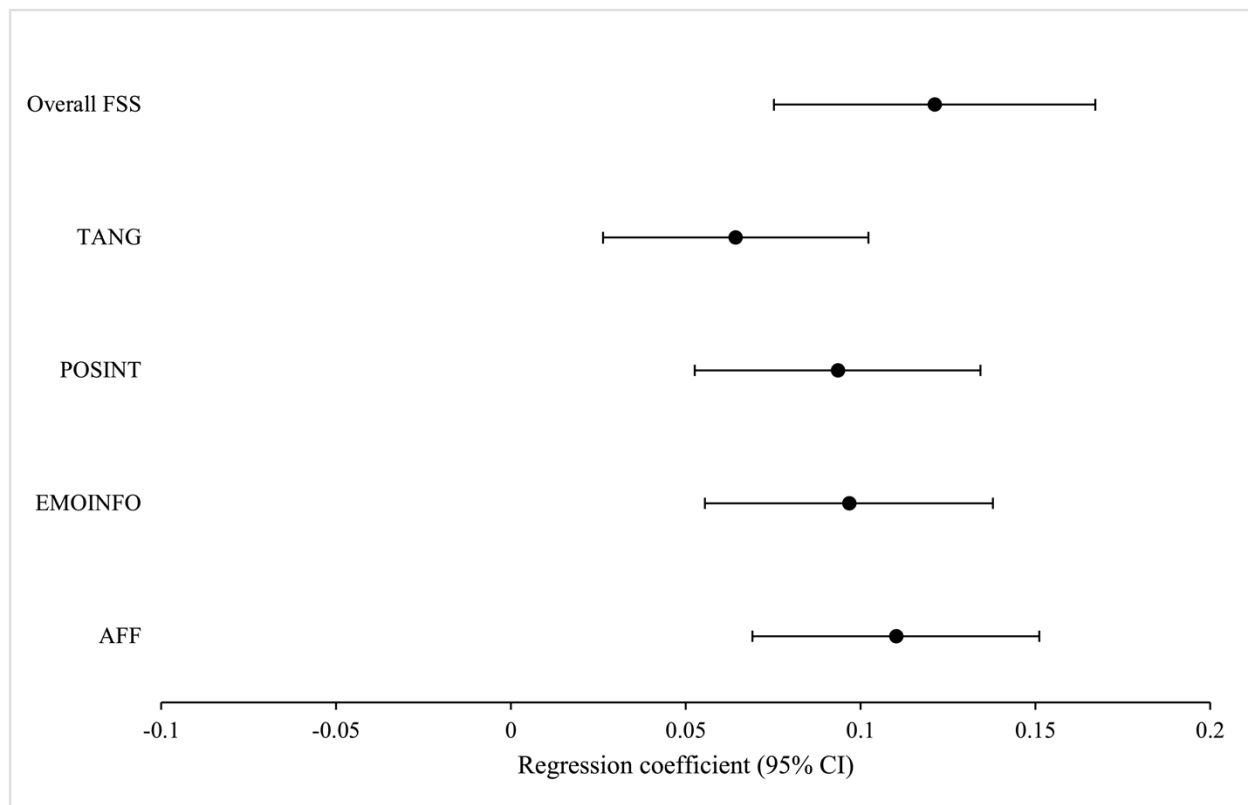


Figure 4. Forest Plot of the Base Model for the Association Between FSS and Memory

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770.

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Note. The base model was adjusted for time, sex, age group, and province.

Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; POSINT: positive social interactions; TANG: tangible support

Table 7. Base Regression Models for the Association Between FSS and Memory

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.12 (0.08, 0.17)	0.06 (0.03, 0.10)	0.09 (0.05, 0.13)	0.10 (0.06, 0.14)	0.11 (0.07, 0.15)
Time (vs. baseline)					
Follow-up 1	-0.06 (-0.30, 0.17)	-0.11 (-0.31, 0.09)	-0.09 (-0.31, 0.13)	-0.02 (-0.24, 0.19)	-0.01 (-0.23, 0.21)
Follow-up 2	-0.04 (-0.29, 0.21)	0.00 (-0.21, 0.21)	-0.03 (-0.26, 0.19)	-0.08 (-0.30, 0.15)	0.06 (-0.17, 0.29)
Sex (vs. male)					
Female	1.00 (0.95, 1.05)	1.01 (0.95, 1.06)	1.00 (0.95, 1.06)	0.99 (0.94, 1.05)	1.00 (0.95, 1.05)
Age (vs. 45-54 years)					
55-64 years	-0.09 (-0.15, -0.04)	-0.09 (-0.15, -0.04)	-0.09 (-0.15, -0.04)	-0.09 (-0.15, -0.04)	-0.09 (-0.14, -0.04)
65-74 years	-0.40 (-0.47, -0.34)	-0.40 (-0.47, -0.34)	-0.41 (-0.47, -0.34)	-0.40 (-0.47, -0.33)	-0.40 (-0.46, -0.33)
≥ 75 years	-1.07 (-1.15, -0.99)	-1.08 (-1.15, -1.00)	-1.07 (-1.15, -0.99)	-1.07 (-1.15, -0.99)	-1.07 (-1.15, -0.99)
Province (vs. Ontario)					
Alberta	0.03 (-0.06, 0.13)	0.03 (-0.07, 0.13)	0.03 (-0.07, 0.13)	0.03 (-0.07, 0.13)	0.03 (-0.07, 0.13)
British Columbia	0.09 (0.00, 0.18)	0.09 (-0.00, 0.18)	0.09 (-0.00, 0.18)	0.09 (0.00, 0.18)	0.09 (-0.00, 0.18)
Manitoba	-0.04 (-0.16, 0.08)	-0.04 (-0.16, 0.07)	-0.04 (-0.16, 0.07)	-0.04 (-0.16, 0.08)	-0.04 (-0.16, 0.08)
New Brunswick	-0.17 (-0.28, -0.05)	-0.17 (-0.29, -0.05)	-0.17 (-0.29, -0.05)	-0.16 (-0.28, -0.05)	-0.17 (-0.29, -0.05)
Newfoundland & Labrador	-0.10 (-0.23, 0.02)	-0.10 (-0.23, 0.02)	-0.10 (-0.23, 0.02)	-0.10 (-0.22, 0.02)	-0.10 (-0.23, 0.02)
Nova Scotia	-0.05 (-0.16, 0.06)	-0.05 (-0.16, 0.06)	-0.05 (-0.16, 0.06)	-0.05 (-0.16, 0.06)	-0.05 (-0.16, 0.06)
Prince Edward Island	-0.06 (-0.19, 0.06)	-0.06 (-0.19, 0.06)	-0.06 (-0.19, 0.07)	-0.06 (-0.19, 0.06)	-0.06 (-0.19, 0.06)
Quebec	-0.10 (-0.18, -0.02)	-0.11 (-0.19, -0.03)	-0.11 (-0.19, -0.03)	-0.10 (-0.18, -0.01)	-0.10 (-0.18, -0.02)
Saskatchewan	-0.07 (-0.19, 0.05)	-0.07 (-0.19, 0.05)	0.07 (-0.19, 0.05)	-0.07 (-0.19, 0.05)	-0.07 (-0.19, 0.05)
FSS*Time (vs. baseline)					
Follow-up 1	0.02 (-0.03, 0.08)	0.03 (-0.01, 0.08)	0.03 (-0.02, 0.08)	0.01 (-0.04, 0.06)	0.01 (-0.04, 0.06)
Follow-up 2	0.03 (-0.03, 0.08)	0.02 (-0.03, 0.06)	0.02 (-0.03, 0.07)	0.03 (-0.02, 0.08)	0.00 (-0.05, 0.05)

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, Archives of Gerontology and Geriatrics, 131, 105770. <https://doi.org/10.1016/j.archger.2025.105770>. © 2025 Elsevier B.V. This is an open-access article under the Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License (<http://creativecommons.org/licenses/bync-nd/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

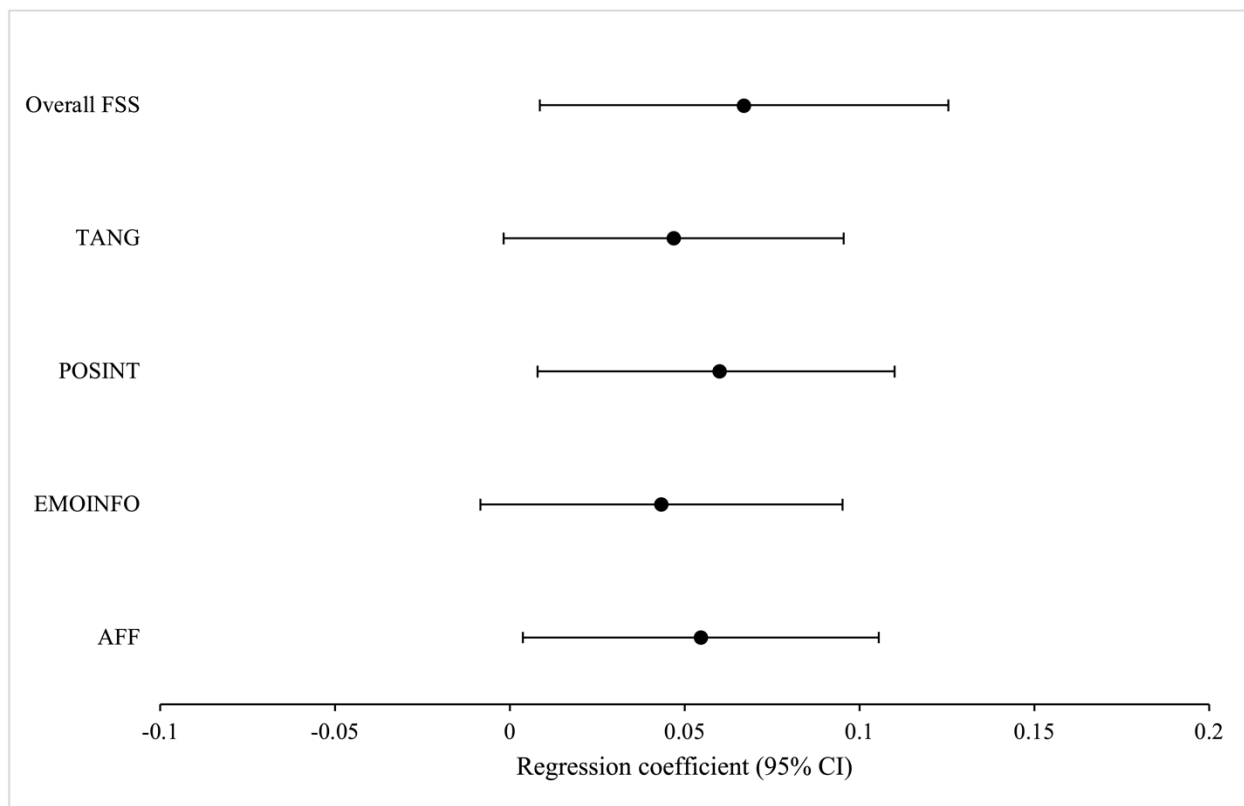


Figure 5. Forest Plot of the Fully Adjusted Model for the Association Between FSS and Memory

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770.

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Note. The fully adjusted model was adjusted for time, age, sex, province, education, income, living arrangement, chronic conditions, functional status, depressive symptoms, smoking status, and alcohol use.

Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; POSINT: positive social interactions; TANG: tangible support

Table 8. Fully Adjusted Regression Models for the Association Between FSS and Memory

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.07 (0.01, 0.13)	0.05 (-0.00, 0.10)	0.06 (0.01, 0.11)	0.04 (-0.01, 0.10)	0.05 (0.00, 0.11)
Time (vs. baseline)					
Follow-up 1	-0.12 (-0.42, 0.17)	-0.11 (-0.36, 0.13)	-0.08 (-0.35, 0.19)	-0.12 (-0.38, 0.15)	-0.05 (-0.32, 0.22)
Follow-up 2	-0.09 (-0.40, 0.22)	-0.02 (-0.28, 0.25)	-0.03 (-0.31, 0.26)	-0.12 (-0.41, 0.17)	-0.01 (-0.29, 0.28)
Sex (vs. male)					
Female	1.08 (1.03, 1.14)	1.09 (1.03, 1.15)	1.08 (1.03, 1.14)	1.08 (1.02, 1.14)	1.09 (1.03, 1.14)
Age (vs. 45-54 years)					
55-64 years	-0.08 (-0.14, -0.01)	-0.08 (-0.14, -0.01)	-0.08 (-0.14, -0.01)	-0.07 (-0.13, -0.01)	-0.07 (-0.13, -0.00)
65-74 years	-0.34 (-0.42, -0.26)	-0.34 (-0.42, -0.27)	-0.34 (-0.42, -0.26)	-0.34 (-0.41, -0.26)	-0.34 (-0.41, -0.26)
≥ 75 years	-0.94 (-1.04, -0.85)	-0.95 (-1.04, -0.85)	-0.94 (-1.04, -0.85)	-0.94 (-1.03, -0.85)	-0.94 (-1.03, -0.85)
Province (vs. Ontario)					
Alberta	0.01 (-0.09, 0.11)	0.01 (-0.09, 0.11)	0.01 (-0.10, 0.11)	0.01 (-0.09, 0.11)	0.01 (-0.10, 0.11)
British Columbia	0.08 (-0.02, 0.17)	0.08 (-0.02, 0.17)	0.08 (-0.02, 0.17)	0.08 (-0.02, 0.17)	0.07 (-0.03, 0.17)
Manitoba	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)	-0.01 (-0.14, 0.11)	-0.01 (-0.14, 0.11)
New Brunswick	-0.08 (-0.20, 0.05)	-0.08 (-0.20, 0.05)	-0.08 (-0.20, 0.05)	-0.07 (-0.20, 0.05)	-0.07 (-0.20, 0.05)
Newfoundland & Labrador	-0.04 (-0.17, 0.10)	-0.04 (-0.17, 0.10)	-0.04 (-0.17, 0.10)	-0.03 (-0.17, 0.10)	-0.03 (-0.17, 0.10)
Nova Scotia	0.02 (-0.10, 0.13)	0.02 (-0.10, 0.13)	0.02 (-0.10, 0.13)	0.02 (-0.09, 0.13)	0.02 (-0.10, 0.13)
Prince Edward Island	-0.06 (-0.20, 0.07)	-0.06 (-0.20, 0.07)	-0.06 (-0.19, 0.07)	-0.06 (-0.19, 0.07)	-0.06 (-0.19, 0.07)
Quebec	-0.07 (-0.16, 0.02)	-0.08 (-0.16, 0.01)	-0.07 (-0.16, 0.01)	-0.06 (-0.15, 0.02)	-0.07 (-0.15, 0.02)
Saskatchewan	-0.07 (-0.20, 0.06)	-0.07 (-0.20, 0.06)	-0.07 (-0.20, 0.06)	-0.07 (-0.20, 0.06)	-0.07 (-0.20, 0.06)
Education (vs. less than high school)					
High school diploma	0.28 (0.14, 0.42)	0.28 (0.14, 0.42)	0.28 (0.14, 0.42)	0.28 (0.14, 0.42)	0.28 (0.14, 0.42)
Some post-secondary education	0.44 (0.28, 0.60)	0.44 (0.29, 0.60)	0.44 (0.28, 0.60)	0.44 (0.28, 0.60)	0.44 (0.29, 0.60)
Post-secondary diploma/degree	0.57 (0.45, 0.69)	0.57 (0.45, 0.70)	0.57 (0.45, 0.70)	0.57 (0.44, 0.69)	0.57 (0.45, 0.70)
Annual household income (vs. $\leq$ \$19,999)					
\$ 20,000 – 49,999	0.16 (0.03, 0.28)	0.16 (0.04, 0.29)	0.16 (0.04, 0.28)	0.16 (0.04, 0.29)	0.16 (0.04, 0.29)
\$ 50,000 – 99,999	0.30 (0.17, 0.43)	0.31 (0.18, 0.43)	0.30 (0.17, 0.43)	0.30 (0.18, 0.43)	0.31 (0.18, 0.44)
\$ 100,000 – 149,999	0.48 (0.34, 0.62)	0.49 (0.35, 0.63)	0.48 (0.35, 0.62)	0.49 (0.35, 0.63)	0.49 (0.35, 0.63)

≥ \$ 150,000	0.57 (0.42, 0.71)	0.58 (0.43, 0.72)	0.57 (0.43, 0.72)	0.58 (0.43, 0.72)	0.58 (0.43, 0.72)
Living arrangement (vs. living alone)					
Living with others	-0.09 (-0.16, -0.02)	-0.10 (-0.16, -0.03)	-0.08 (-0.15, -0.02)	-0.07 (-0.14, -0.01)	-0.09 (-0.16, -0.02)
Chronic conditions (vs. no chronic conditions)					
One or more conditions	-0.14 (-0.24, -0.05)	-0.14 (-0.24, -0.05)	-0.14 (-0.24, -0.05)	-0.14 (-0.24, -0.05)	-0.14 (-0.23, -0.04)
Functional status (vs. no impairment)					
Mild impairment	0.09 (0.02, 0.16)	0.09 (0.02, 0.16)	0.09 (0.02, 0.16)	0.09 (0.02, 0.16)	0.09 (0.02, 0.16)
Moderate impairment	-0.27 (-0.44, -0.11)	-0.28 (-0.44, -0.11)	-0.27 (-0.44, -0.10)	-0.27 (-0.44, -0.10)	-0.27 (-0.44, -0.10)
Severe or total impairment	-0.66 (-0.89, -0.42)	-0.68 (-0.91, -0.44)	-0.64 (-0.88, -0.41)	-0.66 (-0.89, -0.42)	-0.67 (-0.90, -0.43)
Depressive symptoms (vs. score of < 10)					
score of ≥ 10	-0.08 (-0.14, -0.02)	-0.09 (-0.15, -0.03)	-0.08 (-0.14, -0.02)	-0.09 (-0.15, -0.03)	-0.10 (-0.16, -0.03)
Smoking status (vs. never smoker)					
Occasional smoker	-0.05 (-0.21, 0.10)	-0.05 (-0.21, 0.10)	-0.05 (-0.21, 0.10)	-0.05 (-0.21, 0.10)	-0.04 (-0.19, 0.11)
Daily smoker	-0.05 (-0.15, 0.06)	-0.05 (-0.15, 0.05)	-0.05 (-0.15, 0.05)	-0.05 (-0.15, 0.06)	-0.05 (-0.15, 0.05)
Alcohol use (vs. never)					
Less than once per month	0.05 (-0.04, 0.14)	0.05 (-0.03, 0.14)	0.05 (-0.04, 0.14)	0.05 (-0.04, 0.14)	0.05 (-0.03, 0.14)
1-3 per month	0.13 (0.04, 0.21)	0.13 (0.04, 0.22)	0.13 (0.04, 0.21)	0.13 (0.04, 0.22)	0.13 (0.04, 0.22)
1 or more times a week	0.08 (0.00, 0.16)	0.08 (0.01, 0.16)	0.08 (-0.00, 0.16)	0.08 (0.00, 0.16)	0.09 (0.01, 0.17)
FSS*Time (vs. baseline)					
Follow-up 1	0.04 (-0.03, 0.10)	0.04 (-0.02, 0.09)	0.03 (-0.03, 0.09)	0.04 (-0.02, 0.10)	0.02 (-0.04, 0.08)
Follow-up 2	0.04 (-0.03, 0.11)	0.02 (-0.04, 0.08)	0.03 (-0.04, 0.09)	0.05 (-0.02, 0.11)	0.02 (-0.04, 0.08)

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, Archives of Gerontology and Geriatrics, 131, 105770. <https://doi.org/10.1016/j.archger.2025.105770>. © 2025 Elsevier B.V. This is an open-access article under the Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License (<http://creativecommons.org/licenses/bync-nd/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β: regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

After adding the FSS (overall and subtypes) and marital status interactions to the base and fully adjusted models, the effects of FSS on memory were not found to be significantly different between WDS and single participants, or between married or common-law and single participants (Figures 6 and 7; Tables 9 and 10). Likelihood ratio tests were then used to formally assess FSS (overall and subtypes) and marital status interactions by comparing models with and without the interaction terms. The test results indicated that, for most fitted regression models, no statistically significant differences existed between the simpler models and the more complex models with the FSS*marital status interaction (Table 11). The only exceptions were the base models for the tangible support*marital status interaction (likelihood ratio test $p = 0.05$) and the emotional/informational support*marital status interaction (likelihood ratio test $p = 0.03$). However, these interactions did not remain significant in the fully adjusted models.

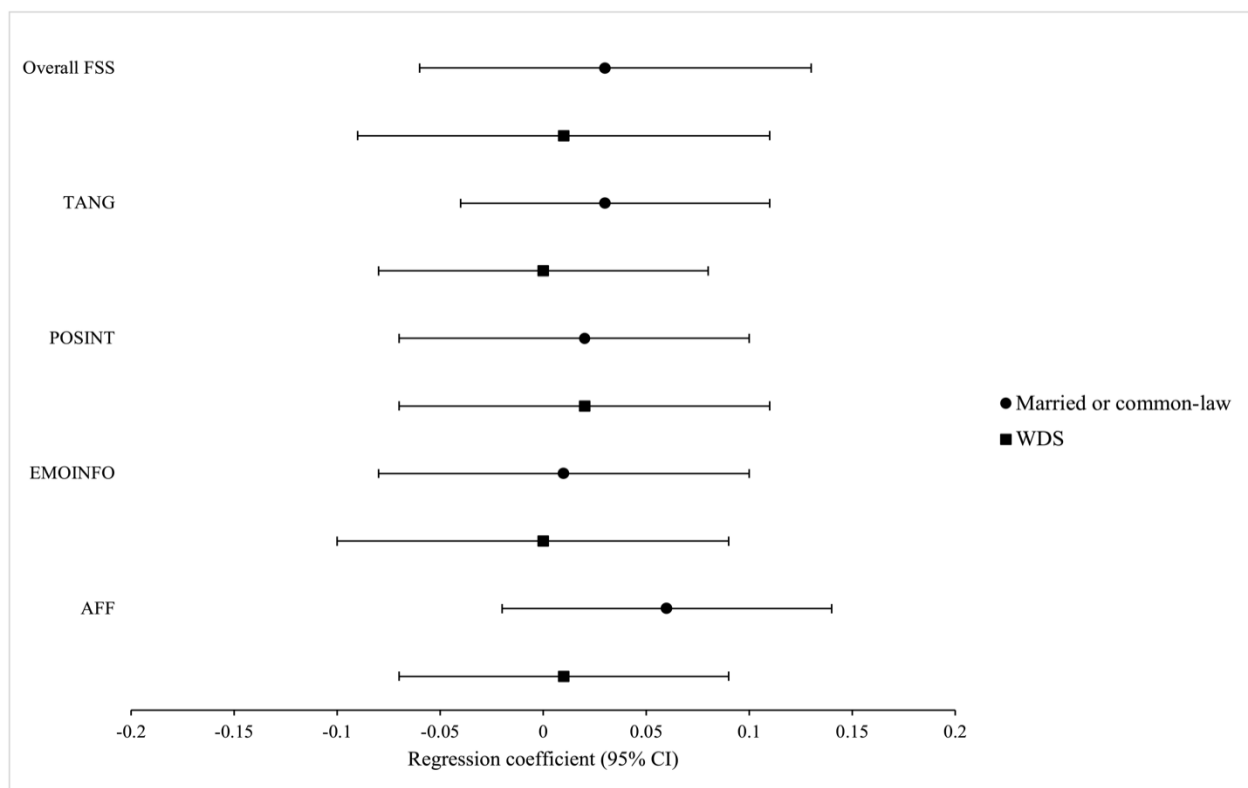


Figure 6. Forest Plot of the Base Model for the Association Between the FSS*Marital Status Interaction Term and Memory

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghghi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770. <https://doi.org/10.1016/j.archger.2025.105770>. © 2025 Elsevier B.V. This is an open-access article under the

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Note. The reference category was single individuals. The base model was adjusted for time, sex, age group, and province.

Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; POSINT: positive social interactions; TANG: tangible support; WDS: widowed, divorced, or separated

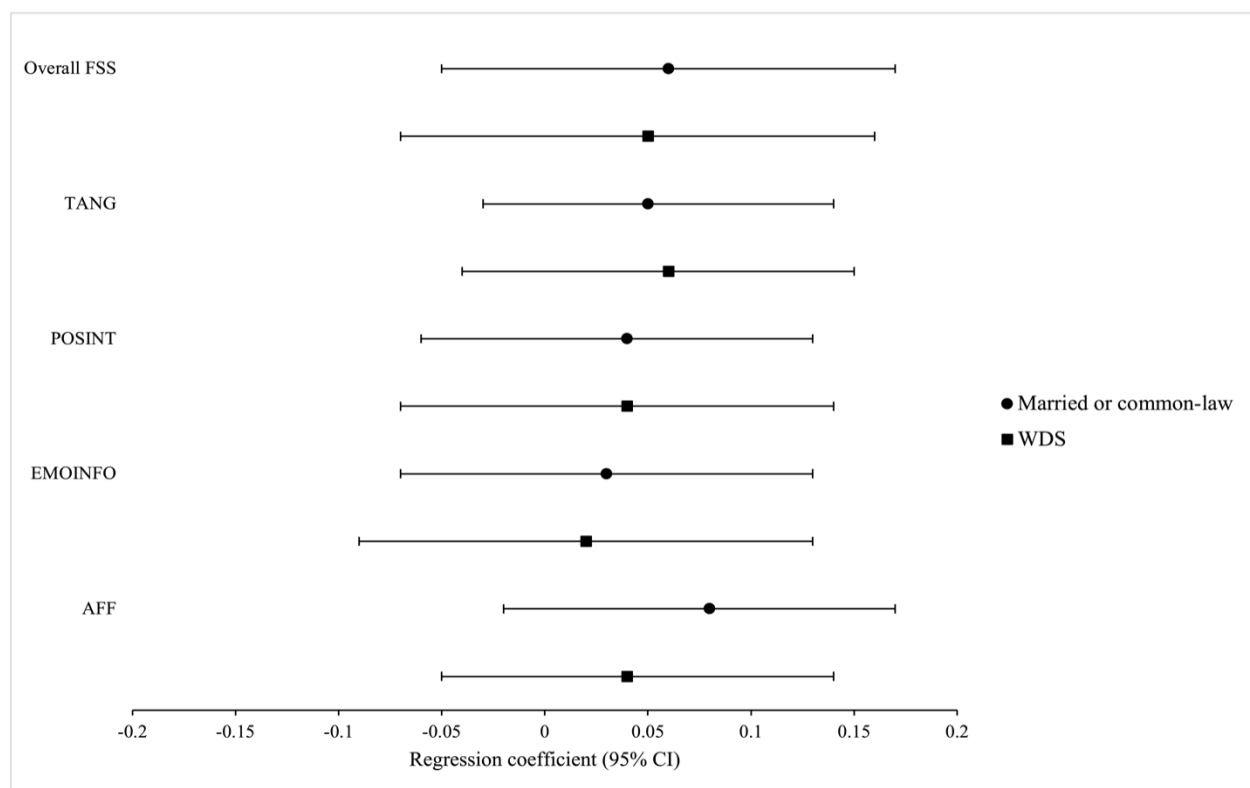


Figure 7. Forest Plot of the Fully Adjusted Model for the Association Between the FSS*Marital Status Interaction Term and Memory

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770.

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Note. The reference category was single individuals. The fully adjusted model was adjusted for time, age, sex, province, education, income, living arrangement, chronic conditions, functional status, depressive symptoms, smoking status, and alcohol use.

Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; POSINT: positive social interactions; TANG: tangible support; WDS: widowed, divorced, or separated

Table 9. Base Regression Models for the Association Between FSS and Memory, with Marital Status Interaction Term

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.09 (-0.00, 0.18)	0.03 (-0.04, 0.11)	0.07 (-0.01, 0.15)	0.09 (-0.00, 0.17)	0.07 (-0.01, 0.14)
Marital status (vs. single)					
Widowed, divorced, or separated	-0.01 (-0.42, 0.40)	0.04 (-0.28, 0.35)	-0.05 (-0.42, 0.32)	0.07 (-0.33, 0.46)	-0.00 (-0.34, 0.34)
Married or common-law	-0.04 (-0.43, 0.36)	-0.01 (-0.32, 0.30)	0.05 (-0.31, 0.40)	0.09 (-0.28, 0.46)	-0.17 (-0.51, 0.18)
FSS*Marital status (vs. single)					
Widowed, divorced, or separated	0.01 (-0.09, 0.11)	0.00 (-0.08, 0.08)	0.02 (-0.07, 0.11)	-0.00 (-0.10, 0.09)	0.01 (-0.07, 0.09)
Married or common-law	0.03 (-0.06, 0.13)	0.03 (-0.04, 0.11)	0.02 (-0.07, 0.10)	0.01 (-0.08, 0.10)	0.06 (-0.02, 0.14)
Time (vs. baseline)					
Follow-up 1	-0.07 (-0.31, 0.17)	-0.13 (-0.33, 0.07)	-0.09 (-0.31, 0.13)	-0.02 (-0.24, 0.20)	-0.02 (-0.24, 0.21)
Follow-up 2	-0.04 (-0.29, 0.21)	-0.02 (-0.22, 0.19)	-0.02 (-0.25, 0.20)	-0.07 (-0.30, 0.16)	0.05 (-0.18, 0.29)
Sex (vs. male)					
Female	1.01 (0.96, 1.07)	1.02 (0.97, 1.08)	1.01 (0.96, 1.07)	1.01 (0.95, 1.06)	1.01 (0.96, 1.06)
Age (vs. 45-54 years)					
55-64 years	-0.09 (-0.15, -0.04)	-0.09 (-0.14, -0.03)	-0.09 (-0.15, -0.04)	-0.09 (-0.14, -0.04)	-0.09 (-0.14, -0.04)
65-74 years	-0.40 (-0.47, -0.33)	-0.40 (-0.47, -0.33)	-0.40 (-0.47, -0.34)	-0.40 (-0.46, -0.33)	-0.40 (-0.46, -0.33)
≥ 75 years	-1.06 (-1.14, -0.98)	-1.07 (-1.15, -0.99)	-1.06 (-1.15, -0.98)	-1.06 (-1.14, -0.98)	-1.06 (-1.14, -0.98)
Province (vs. Ontario)					
Alberta	0.03 (-0.07, 0.13)	0.02 (-0.07, 0.12)	0.03 (-0.07, 0.13)	0.03 (-0.07, 0.13)	0.03 (-0.07, 0.12)
British Columbia	0.09 (0.00, 0.18)	0.08 (-0.01, 0.17)	0.09 (-0.00, 0.18)	0.09 (0.00, 0.18)	0.09 (-0.00, 0.18)
Manitoba	-0.04 (-0.16, 0.08)	-0.04 (-0.16, 0.07)	-0.04 (-0.16, 0.07)	-0.04 (-0.16, 0.08)	-0.04 (-0.16, 0.08)
New Brunswick	-0.17 (-0.28, -0.05)	-0.17 (-0.29, -0.05)	-0.17 (-0.28, -0.05)	-0.16 (-0.28, -0.05)	-0.17 (-0.28, -0.05)
Newfoundland & Labrador	-0.10 (-0.23, 0.02)	-0.10 (-0.23, -0.02)	-0.10 (-0.23, 0.02)	-0.10 (-0.23, 0.02)	-0.10 (-0.23, 0.02)
Nova Scotia	-0.05 (-0.16, 0.06)	-0.05 (-0.16, 0.06)	-0.05 (-0.16, 0.06)	-0.05 (-0.16, 0.06)	-0.05 (-0.16, 0.06)
Prince Edward Island	-0.06 (-0.19, 0.06)	-0.06 (-0.19, 0.06)	-0.06 (-0.19, 0.06)	-0.06 (-0.19, 0.06)	-0.06 (-0.19, 0.06)
Quebec	-0.10 (-0.18, -0.02)	-0.11 (-0.19, -0.03)	-0.10 (-0.19, -0.02)	-0.09 (-0.17, -0.01)	-0.10 (-0.18, -0.01)
Saskatchewan	-0.07 (-0.19, 0.05)	-0.07 (-0.20, 0.05)	-0.07 (-0.19, 0.05)	-0.07 (-0.19, 0.05)	-0.07 (-0.19, 0.05)
FSS*Time (vs. baseline)					
Follow-up 1	0.02 (-0.03, 0.08)	0.04 (-0.01, 0.08)	0.03 (-0.02, 0.08)	0.01 (-0.04, 0.06)	0.01 (-0.04, 0.06)
Follow-up 2	0.03 (-0.03, 0.08)	0.02 (-0.03, 0.07)	0.02 (-0.03, 0.07)	0.03 (-0.02, 0.08)	0.00 (-0.05, 0.06)

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, Archives of Gerontology and Geriatrics, 131, 105770.

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Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Table 10. Fully Adjusted Regression Models for the Association Between FSS and Memory, with Marital Status Interaction Term

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.02 (-0.09, 0.13)	-0.00 (-0.09, 0.08)	0.03 (-0.07, 0.13)	0.01 (-0.09, 0.11)	0.00 (-0.09, 0.09)
Marital status (vs. single)					
Widowed, divorced, or separated	-0.13 (-0.61, 0.34)	-0.17 (-0.53, 0.20)	-0.10 (-0.52, 0.33)	-0.02 (-0.47, 0.43)	-0.12 (-0.52, 0.27)
Married or common-law	-0.20 (-0.65, 0.25)	-0.16 (-0.52, 0.20)	-0.10 (-0.51, 0.32)	-0.08 (-0.50, 0.35)	-0.28 (-0.68, 0.12)
FSS*Marital status (vs. single)					
Widowed, divorced, or separated	0.05 (-0.07, 0.16)	0.06 (-0.04, 0.15)	0.04 (-0.07, 0.14)	0.02 (-0.09, 0.13)	0.04 (-0.05, 0.14)
Married or common-law	0.06 (-0.05, 0.17)	0.05 (-0.03, 0.14)	0.04 (-0.06, 0.13)	0.03 (-0.07, 0.13)	0.08 (-0.02, 0.17)
Time (vs. baseline)					
Follow-up 1	-0.13 (-0.42, 0.17)	-0.11 (-0.36, 0.13)	-0.08 (-0.35, 0.19)	-0.14 (-0.40, 0.12)	-0.02 (-0.30, 0.25)
Follow-up 2	-0.09 (-0.41, 0.22)	-0.01 (-0.28, 0.25)	-0.03 (-0.31, 0.26)	-0.15 (-0.43, 0.12)	0.02 (-0.28, 0.31)
Sex (vs. male)					
Female	1.08 (1.03, 1.14)	1.09 (1.03, 1.15)	1.09 (1.03, 1.14)	1.09 (1.03, 1.14)	1.08 (1.03, 1.14)
Age (vs. 45-54 years)					
55-64 years	-0.08 (-0.14, -0.01)	-0.08 (-0.14, -0.02)	-0.08 (-0.14, -0.01)	-0.07 (-0.13, -0.01)	-0.08 (-0.14, -0.01)
65-74 years	-0.34 (-0.42, -0.27)	-0.35 (-0.42, -0.27)	-0.34 (-0.42, -0.27)	-0.34 (-0.42, -0.26)	-0.34 (-0.42, -0.26)
≥ 75 years	-0.95 (-1.04, -0.85)	-0.95 (-1.05, -0.86)	-0.95 (-1.04, -0.85)	-0.94 (-1.03, -0.85)	-0.95 (-1.04, -0.85)
Province (vs. Ontario)					
Alberta	0.01 (-0.09, 0.11)	0.01 (-0.09, 0.11)	0.01 (-0.10, 0.11)	0.01 (-0.10, 0.11)	0.01 (-0.10, 0.11)
British Columbia	0.08 (-0.02, 0.17)	0.08 (-0.02, 0.17)	0.08 (-0.02, 0.17)	0.07 (-0.02, 0.17)	0.07 (-0.02, 0.17)
Manitoba	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)	-0.01 (-0.14, 0.11)	-0.02 (-0.14, 0.11)
New Brunswick	-0.08 (-0.20, 0.05)	-0.08 (-0.20, 0.05)	-0.08 (-0.20, 0.05)	-0.07 (-0.20, 0.05)	-0.08 (-0.20, 0.05)
Newfoundland & Labrador	-0.04 (-0.17, 0.10)	-0.04 (-0.17, 0.10)	-0.04 (-0.17, 0.10)	-0.03 (-0.16, 0.10)	-0.04 (-0.17, 0.10)
Nova Scotia	0.02 (-0.10, 0.13)	0.02 (-0.10, 0.13)	0.02 (-0.10, 0.13)	0.02 (-0.10, 0.13)	0.02 (-0.10, 0.13)
Prince Edward Island	-0.06 (-0.20, 0.07)	-0.06 (-0.20, 0.07)	-0.06 (-0.19, 0.07)	-0.06 (-0.19, 0.07)	-0.06 (-0.20, 0.07)
Quebec	-0.07 (-0.16, 0.02)	-0.08 (-0.16, 0.01)	-0.07 (-0.16, 0.01)	-0.06 (-0.15, 0.02)	-0.07 (-0.16, 0.02)
Saskatchewan	-0.07 (-0.20, 0.06)	-0.07 (-0.20, 0.06)	-0.07 (-0.20, 0.06)	-0.06 (-0.19, 0.06)	-0.07 (-0.20, 0.06)
Education (vs. less than high school)					
High school diploma	0.28 (0.14, 0.42)	0.28 (0.14, 0.42)	0.28 (0.14, 0.42)	0.28 (0.14, 0.42)	0.28 (0.14, 0.42)
Some post-secondary education	0.44 (0.29, 0.60)	0.44 (0.29, 0.60)	0.44 (0.29, 0.60)	0.44 (0.28, 0.60)	0.45 (0.29, 0.61)
Post-secondary diploma/degree	0.57 (0.45, 0.70)	0.57 (0.45, 0.70)	0.57 (0.45, 0.70)	0.57 (0.45, 0.69)	0.57 (0.45, 0.70)

Annual household income (vs. ≤ \$19,999)					
\$ 20,000 – 49,999	0.16 (0.04, 0.28)	0.16 (0.04, 0.29)	0.16 (0.03, 0.28)	0.16 (0.04, 0.29)	0.17 (0.04, 0.29)
\$ 50,000 – 99,999	0.30 (0.17, 0.43)	0.31 (0.18, 0.43)	0.30 (0.17, 0.43)	0.30 (0.17, 0.43)	0.31 (0.18, 0.44)
\$ 100,000 – 149,999	0.48 (0.34, 0.62)	0.49 (0.35, 0.63)	0.48 (0.34, 0.62)	0.49 (0.35, 0.63)	0.49 (0.35, 0.63)
≥ \$ 150,000	0.57 (0.42, 0.72)	0.58 (0.43, 0.72)	0.57 (0.42, 0.72)	0.57 (0.43, 0.72)	0.58 (0.43, 0.72)
Living arrangement (vs. living alone)					
Living with others	-0.10 (-0.19, -0.01)	-0.10 (-0.19, -0.01)	-0.09 (-0.18, -0.00)	-0.08 (-0.17, 0.01)	-0.10 (-0.19, -0.00)
Chronic conditions (vs. no chronic conditions)					
One or more conditions	-0.14 (-0.24, -0.05)	-0.14 (-0.24, -0.05)	-0.14 (-0.24, -0.05)	-0.14 (-0.23, -0.04)	-0.14 (-0.24, -0.05)
Functional status (vs. no impairment)					
Mild impairment	0.09 (0.02, 0.16)	0.09 (0.02, 0.16)	0.09 (0.02, 0.16)	0.09 (0.02, 0.16)	0.09 (0.02, 0.16)
Moderate impairment	-0.27 (-0.44, -0.11)	-0.28 (-0.44, -0.11)	-0.27 (-0.44, -0.10)	-0.27 (-0.44, -0.10)	-0.27 (-0.44, -0.10)
Severe or total impairment	-0.66 (-0.89, -0.42)	-0.68 (-0.91, -0.44)	-0.64 (-0.88, -0.41)	-0.67 (-0.90, -0.44)	-0.65 (-0.89, -0.42)
Depressive symptoms (vs. score of < 10)					
score of ≥ 10	-0.08 (-0.14, -0.02)	-0.09 (-0.15, -0.03)	-0.08 (-0.14, -0.02)	-0.09 (-0.15, -0.03)	-0.09 (-0.15, -0.03)
Smoking status (vs. never smoker)					
Occasional smoker	-0.05 (-0.21, 0.10)	-0.05 (-0.20, 0.10)	-0.05 (-0.21, 0.10)	-0.04 (-0.20, 0.11)	-0.05 (-0.20, 0.11)
Daily smoker	-0.05 (-0.15, 0.06)	-0.05 (-0.15, 0.05)	-0.05 (-0.15, 0.06)	-0.05 (-0.15, 0.05)	-0.05 (-0.15, 0.05)
Alcohol use (vs. never)					
Less than once per month	0.05 (-0.04, 0.14)	0.05 (-0.03, 0.14)	0.05 (-0.04, 0.14)	0.05 (-0.03, 0.14)	0.05 (-0.04, 0.14)
1-3 per month	0.13 (0.04, 0.22)	0.13 (0.04, 0.22)	0.13 (0.04, 0.21)	0.13 (0.04, 0.22)	0.13 (0.04, 0.21)
1 or more times a week	0.08 (0.00, 0.16)	0.08 (0.00, 0.16)	0.08 (-0.00, 0.16)	0.09 (0.01, 0.17)	0.08 (0.00, 0.16)
FSS*Time (vs. baseline)					
Follow-up 1	0.04 (-0.03, 0.10)	0.04 (-0.02, 0.09)	0.03 (-0.03, 0.09)	0.04 (-0.02, 0.10)	0.01 (-0.04, 0.07)
Follow-up 2	0.04 (-0.03, 0.11)	0.02 (-0.04, 0.08)	0.03 (-0.04, 0.09)	0.05 (-0.01, 0.12)	0.02 (-0.05, 0.08)

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, Archives of Gerontology and Geriatrics, 131, 105770. <https://doi.org/10.1016/j.archger.2025.105770>. © 2025 Elsevier B.V. This is an open-access article under the Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License (<http://creativecommons.org/licenses/bync-nd/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Table 11. Likelihood Ratio Test Comparing Models With and Without the FSS (Overall or Subtypes) and Marital Status Interaction

	Base Models	Fully Adjusted Models
	p-value	p-value
Overall FSS*Marital Status	0.21	0.75
TANG*Marital Status	0.05	0.65
POSINT*Marital Status	0.11	0.82
EMOINFO*Marital Status	0.03	0.81
AFF*Marital Status	0.11	0.48

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, Archives of Gerontology and Geriatrics, 131, 105770.

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Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; POSINT: positive social interactions; TANG: tangible support

4.3 Sensitivity Analyses

4.3.1 Regression Models Stratified by Baseline Marital Status

Since most participants did not change their marital status over the three timepoints, additional analyses were conducted to compare whether stratifying the sample by baseline marital status, rather than using an FSS*marital status interaction term, would change the association between FSS and memory.

In both the base and fully adjusted models for the married or common-law stratum, overall FSS and each subtype were positively associated with memory. β s ranged from 0.05 to 0.12; the estimates for all FSS subtypes, except for tangible support (in the base model) and emotional/informational support (in the fully adjusted model), were statistically significant at the 5% level (Figures 8 and 9; Tables I1 and J1). The models for affectionate support produced the largest β s.

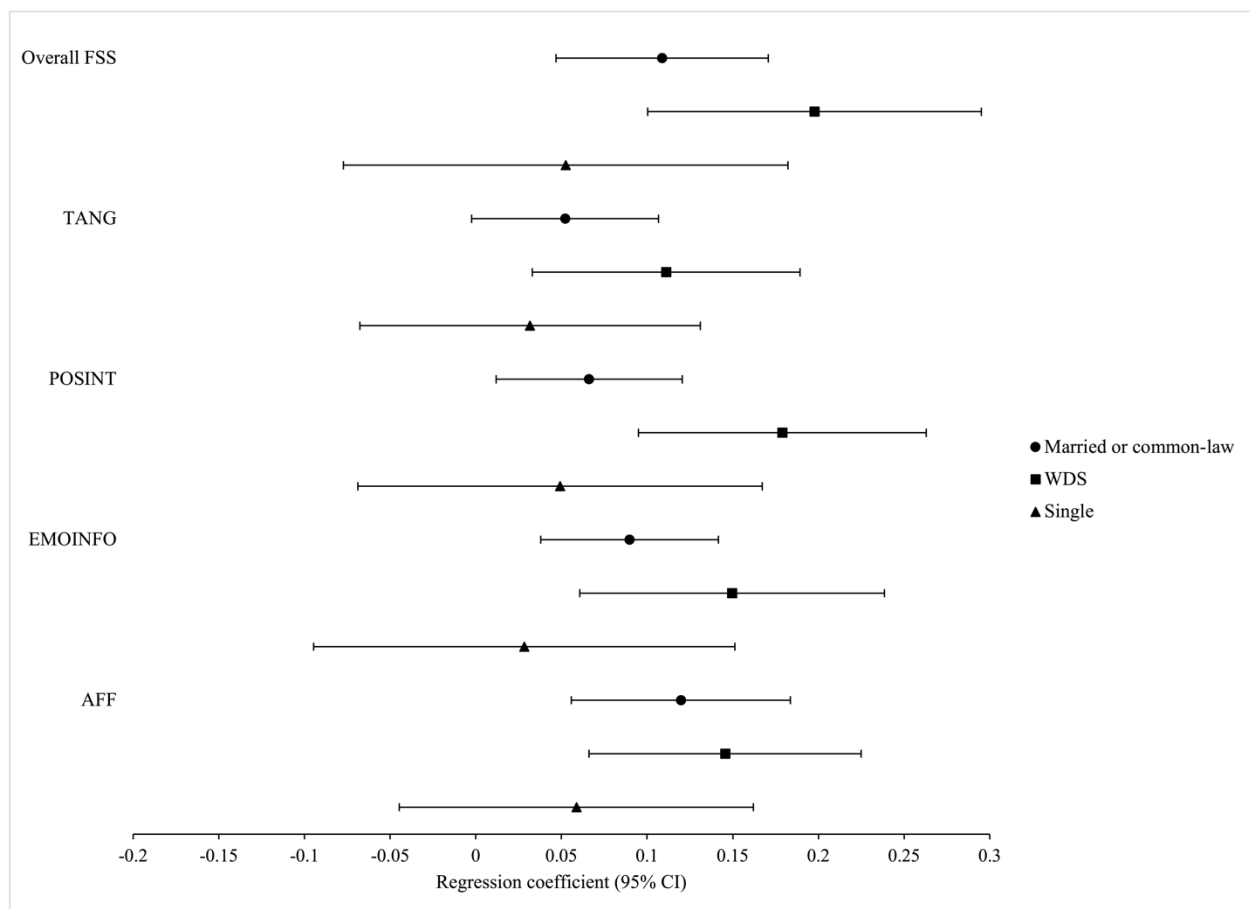


Figure 8. Forest Plot of the Base Models for the Association Between FSS and Memory, Stratified by Baseline Marital Status

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770.

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Note. The base model adjusted for time, sex, age group, and province.

Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; POSINT: positive social interactions; TANG: tangible support; WDS: widowed, divorced, or separated

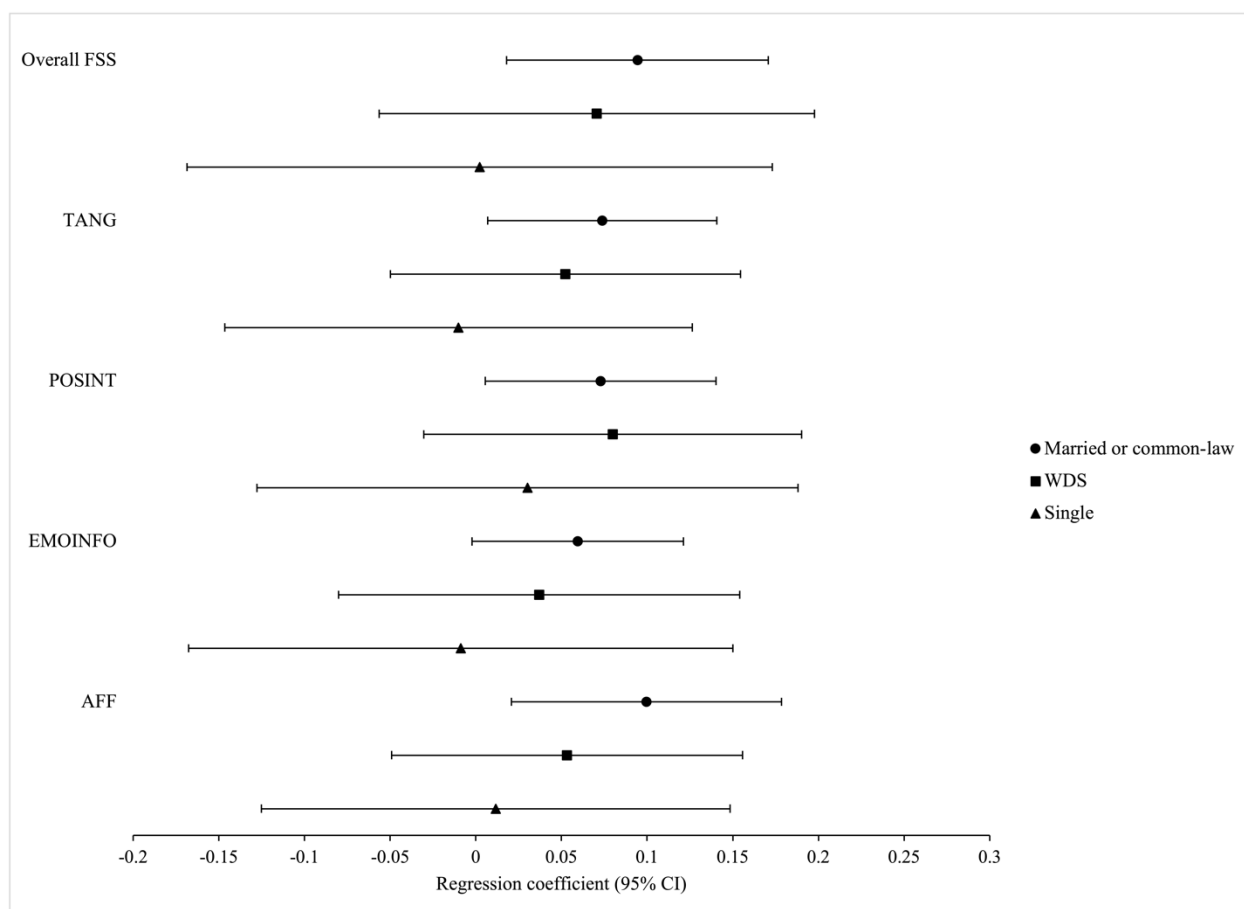


Figure 9. Forest Plot of the Fully Adjusted Models for the Association Between FSS and Memory, Stratified by Baseline Marital Status

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770.

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Note. The fully adjusted model was adjusted for time, age, sex, province, education, income, living arrangement, chronic conditions, functional status, depressive symptoms, smoking status, and alcohol use.

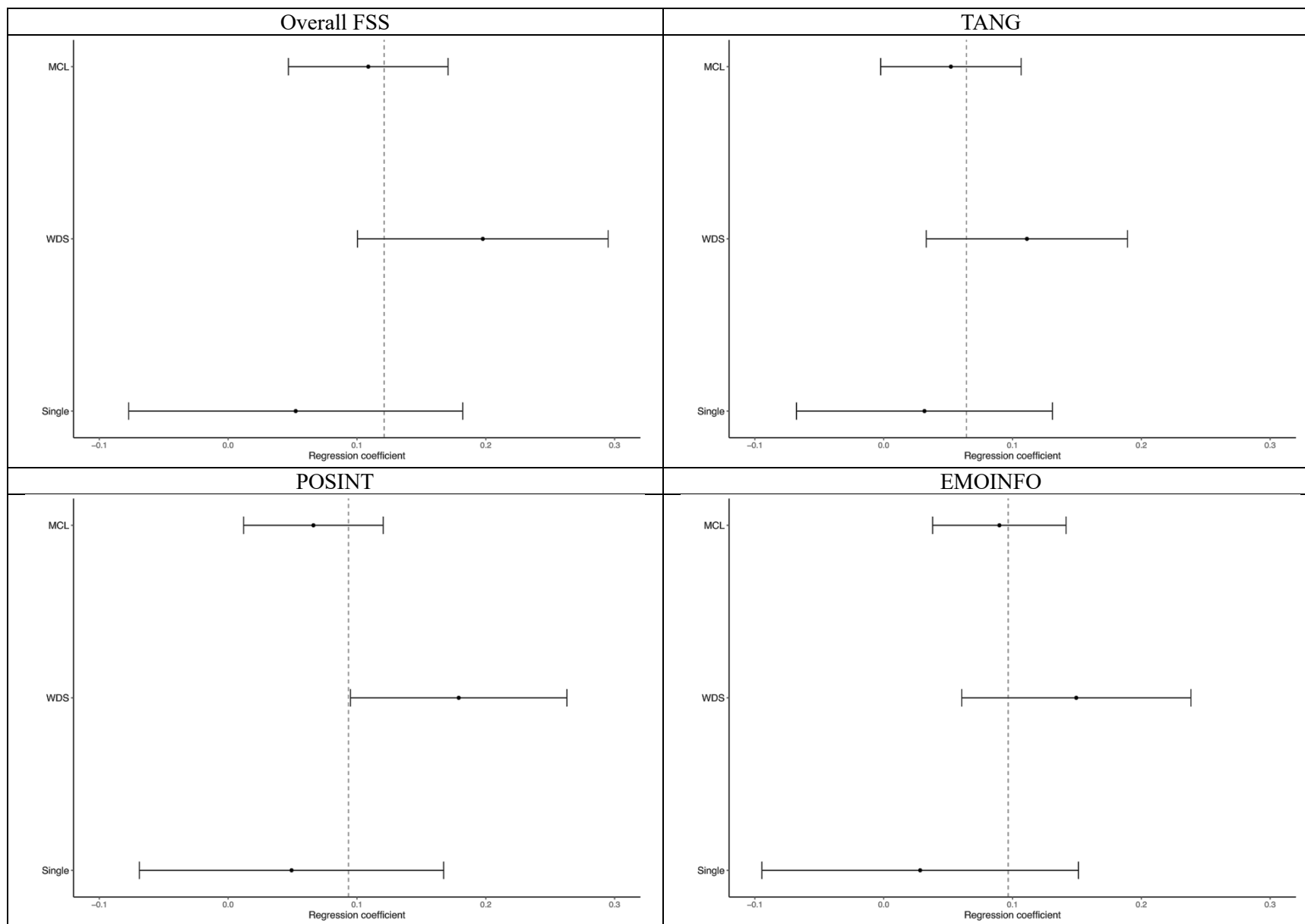
Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; POSINT: positive social interactions; TANG: tangible support; WDS: widowed, divorced, or separated

Similarly, in both the base and fully adjusted models for the WDS stratum, overall FSS and each subtype were positively associated with memory. β s ranged from 0.04 to 0.20. Although the estimates for overall FSS and all subtypes were statistically significant at the 5% level in the base models (Figure 8; Table I2), none of the estimates for any of the FSS subtypes were statistically significant in the fully adjusted models (Figure 9; Table J2). The model for

overall FSS produced the largest β in the base model, whereas positive social interactions produced the largest β in the fully adjusted model.

Overall FSS and each subtype were also mostly positively associated with memory in the ‘single’ stratum. The exceptions were overall FSS, tangible support, and emotional/informational support in the fully adjusted models, though none of these estimates were statistically significant (Figures 8 and 9; Tables I3 and J3). β s ranged from -0.01 to 0.06. The model for affectionate support produced the largest β in the base model, whereas positive social interactions produced the largest β in the fully adjusted model.

The results of Cuzick’s forest plot method (137) for overall FSS and each subtype can be found in Figures 10 and 11. Generally, for effect modification to be present, the stratified confidence intervals must not contain the unstratified regression coefficient. However, in the current study, all confidence intervals contained the unstratified regression coefficient. Thus, I concluded that effect modification was not present for overall FSS or any subtypes, following stratification by participants’ baseline marital status. Therefore, the results of the stratified analysis generally support the conclusions found in the main analysis with the FSS*marital status interaction term.



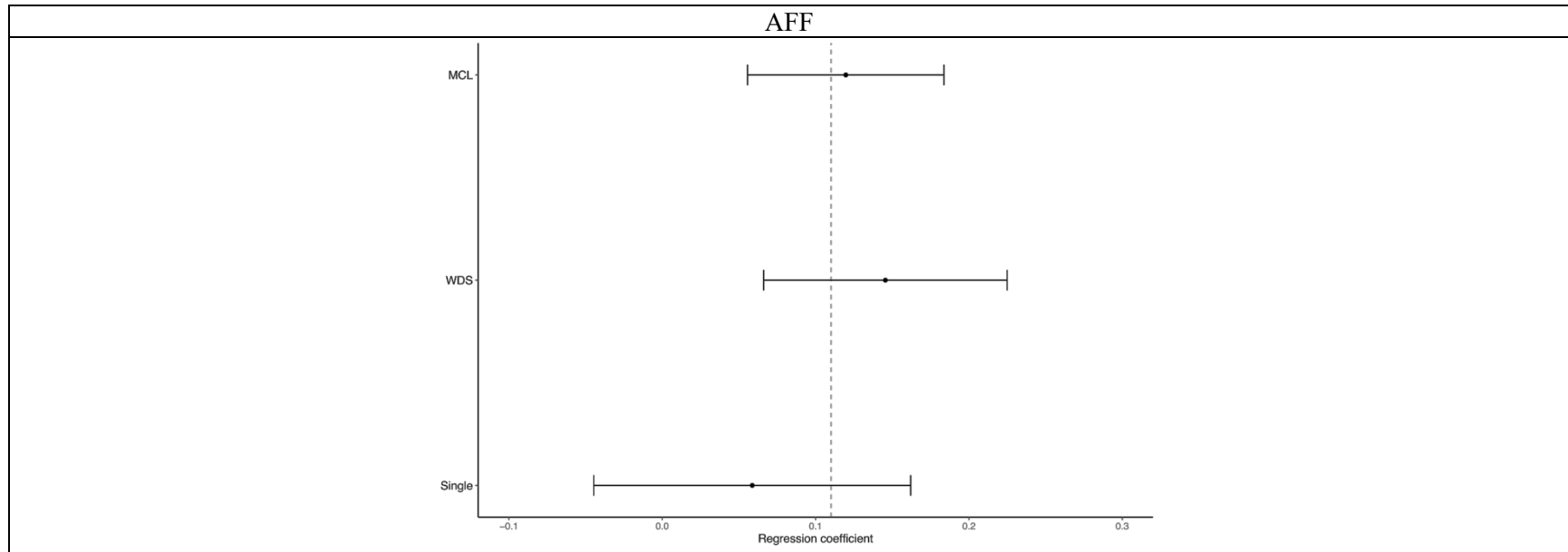
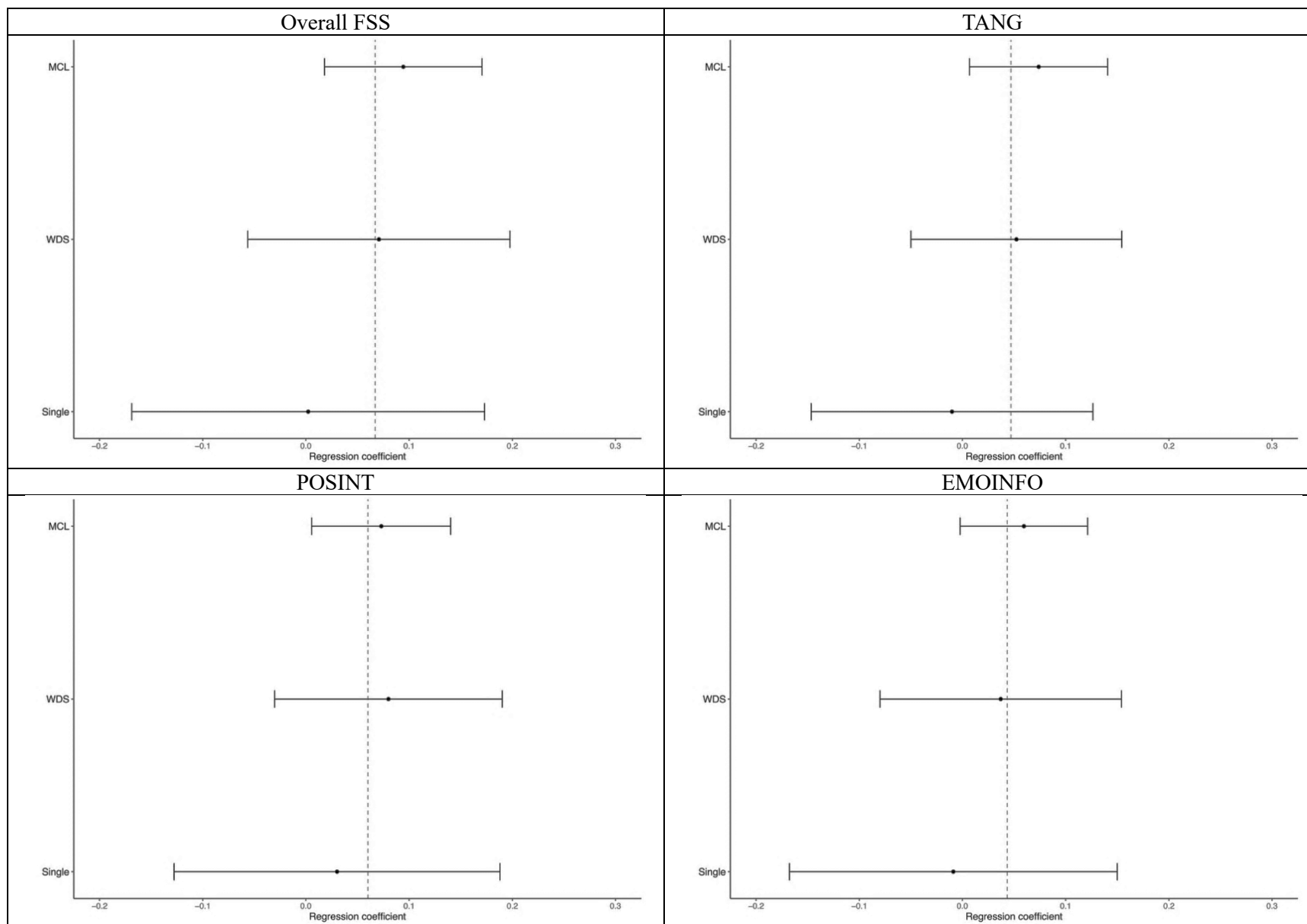


Figure 10. Cuzick's Forest Plots of the Base Models for All FSS Subtypes, Stratified by Baseline Marital Status

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770. <https://doi.org/10.1016/j.archger.2025.105770>. © 2025 Elsevier B.V. This is an open-access article under the Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License (<http://creativecommons.org/licenses/bync-nd/4.0/>). This material is unchanged from its original form.

Note. The horizontal dashed lines represent the regression coefficients for the unstratified regression models (Overall FSS: $\beta = 0.12$; TANG: $\beta = 0.06$; POSINT $\beta = 0.09$; EMOINFO $\beta = 0.10$; AFF $\beta = 0.11$; Table 7).

Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; MCL: married or common-law; POSINT: positive social interactions; TANG: tangible support; WDS: widowed, divorced, or separated



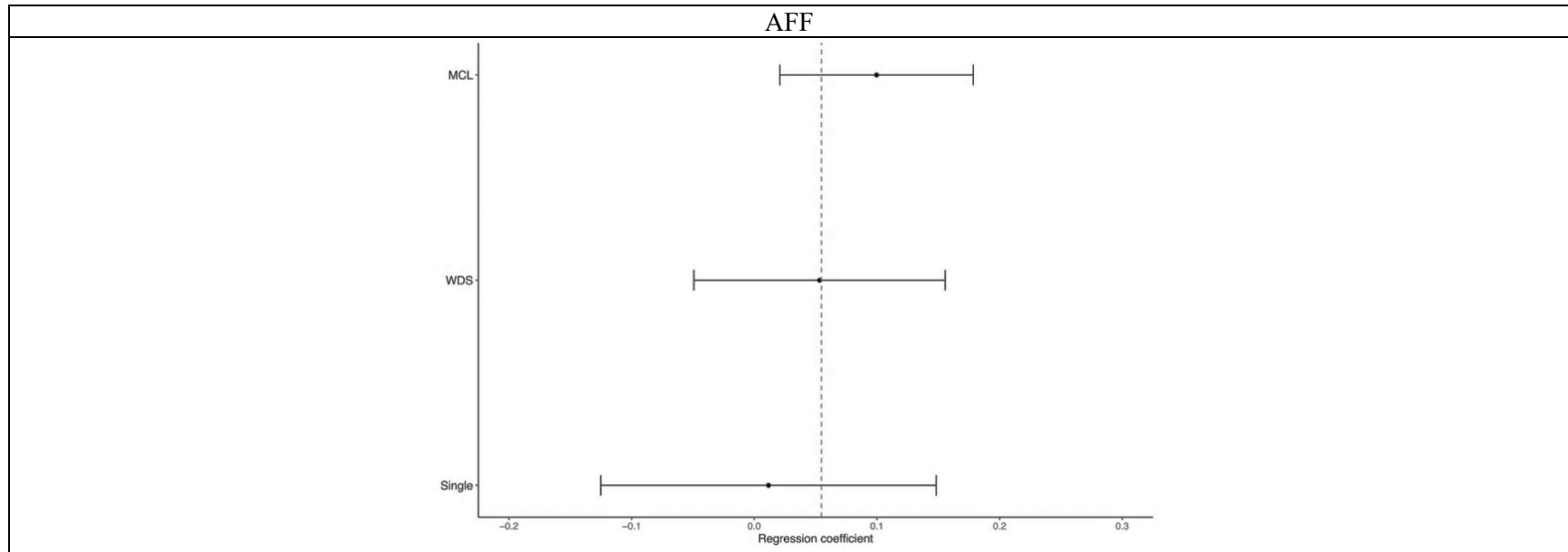


Figure 11. Cuzick's Forest Plots of the Fully Adjusted Models for All FSS Subtypes, Stratified by Baseline Marital Status

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770. <https://doi.org/10.1016/j.archger.2025.105770>. © 2025 Elsevier B.V. This is an open-access article under the Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License (<http://creativecommons.org/licenses/bync-nd/4.0/>). This material is unchanged from its original form.

Note. The horizontal dashed lines represent the regression coefficients for the unstratified regression models (Overall FSS $\beta = 0.07$; TANG $\beta = 0.05$, POSINT $\beta = 0.06$; EMOINFO $\beta = 0.04$; AFF $\beta = 0.05$; Table 8).

Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; MCL: married or common-law; POSINT: positive social interactions; TANG: tangible support; WDS: widowed, divorced, or separated

4.3.2 Regression Models with Multiple Imputation and Missing Data Category Method

Upon comparing the three strategies for addressing missing data (i.e., complete case analysis versus multiple imputation and missing data category), I found the β s were substantively the same for the models without (Figure 12; Appendix K and L) and with the FSS*marital status interaction (Figure 13; Appendix K and L). More specifically, using multiple imputation or the missing category method did not change the direction and magnitude of effects from the initial findings. In most cases, the β s did not change by more than ± 0.01 in the sensitivity analyses compared to the complete case analysis. In addition, for all three methods, no evidence existed to conclude that the association between FSS (overall and subtypes) and memory differed based on marital status, emphasizing the robustness of the findings across different sets of covariates and analytical methods.

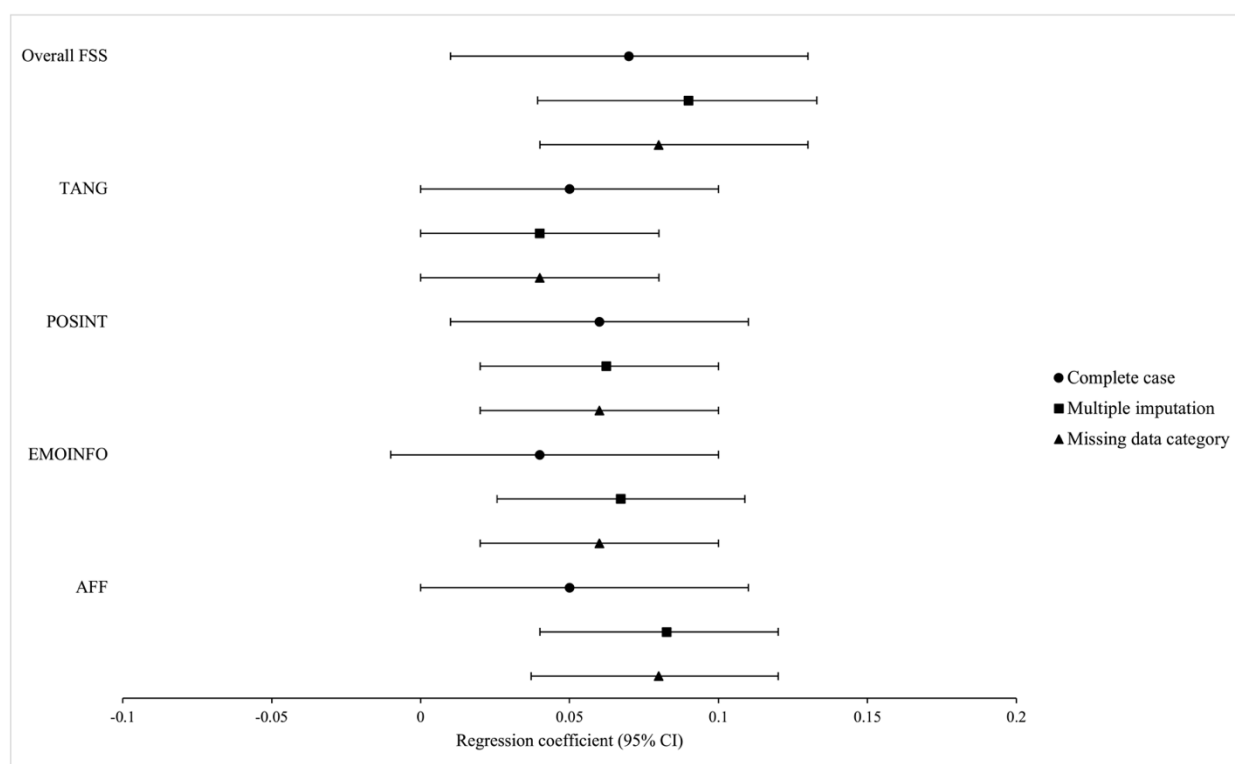


Figure 12. Forest Plot of the Fully Adjusted Models for the Association Between FSS and Memory, Comparing the Three Missing Data Methods

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770. <https://doi.org/10.1016/j.archger.2025.105770>. © 2025 Elsevier B.V. This is an open-access article under the

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Note. The fully adjusted model was adjusted for time, age, sex, province, education, income, living arrangement, chronic conditions, functional status, depressive symptoms, smoking status, and alcohol use.

Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; POSINT: positive social interactions; TANG: tangible support

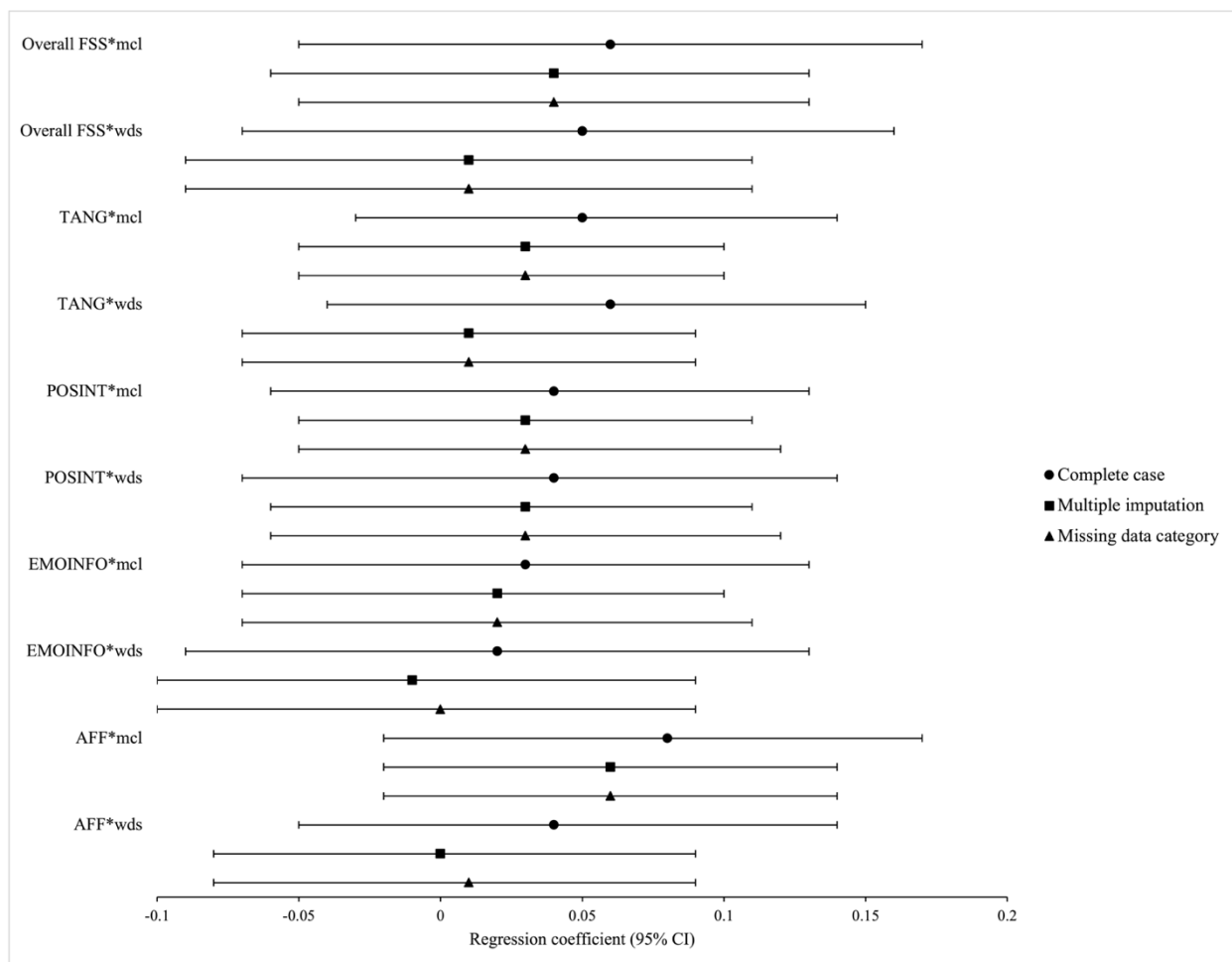


Figure 13. Forest Plot of the Fully Adjusted Models for the Association Between the FSS*Marital Status Interaction Term and Memory, Comparing the Three Missing Data Methods

Source: From *The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging*, by Haghighi, P., Zeng, L., Tyas, S. L., Meyer, S. B., & Oremus, M., 2025, *Archives of Gerontology and Geriatrics*, 131, 105770.

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Note. The reference category was single individuals. The fully adjusted model was adjusted for time, age, sex, province, education, income, living arrangement, chronic conditions, functional status, depressive symptoms, smoking status, and alcohol use.

Abbreviations: AFF: affectionate support; EMOINFO: emotional/informational support; FSS: functional social support; MCL: married or common-law; POSINT: positive social interactions; TANG: tangible support; WDS: widowed, divorced, or separated

4.4 Transition to Qualitative Results

The qualitative results of this sequential explanatory mixed methods study are described in Chapter 5 below. These results are key to understanding and contextualizing the quantitative findings, which did not support the initial hypothesis that marital status would moderate the relationship between FSS and memory. The qualitative results provided multiple insights into the lack of quantitative support for the hypothesis and enriched the interpretations of the relationship between FSS, memory, and marital status.

Chapter 5

Qualitative Results

The qualitative study leveraged the real-life experiences of middle-aged and older adults, with the aim of offering a deeper understanding of how marital status may (or may not) influence the relationship between FSS and memory, especially in light of the limited research on this topic. Interviews were conducted with 18 community-dwelling adults who represented various marital status categories (married: 8; common-law: 2; divorced: 3; widowed: 2; single: 3). Most participants were recruited through an advertisement placed in Coffee News magazine (n = 14), followed by a public library (n = 2), or a referral from another participant (n = 2). The average age of participants was 65.6 ± 10.1 years (range: 46 to 84 years). The majority of participants (72.2%) were female, and nearly all had some form of post-secondary education. On average, participants rated their day-to-day memory as 8.2 out of 10 (range: 5.5 to 10), while their satisfaction with their current marital status received a rating of 8.7 out of 10 (range: 4 to 10) (Table 12).

Table 12. Study Participants' Characteristics (n = 18)

Characteristics	n (%)
Age (in years)	
Mean (SD)	65.6 (10.1)
Sex	
Female	13 (72.2%)
Male	5 (27.8%)
Marital status	
Married	8 (44.4%)
Common-law relationship	2 (11.1%)
Divorced	3 (16.7%)
Widowed	2 (11.1%)
Single	3 (16.7%)
Education	
High school	1 (5.6%)
Post-secondary degree/diploma	15 (83.3%)
Graduate degree	2 (11.1%)
Satisfaction with current marital status (on a scale of 1 to 10)	
Mean (SD)	8.7 (1.7)
Subjective memory rating (on a scale of 1 to 10)	
Mean (SD)	8.2 (1.3)

Abbreviations: SD: standard deviation

Overall, most participants thought FSS can be a positive influence on memory, but they did not consider marital status to be critical to this relationship. They provided three general and interconnected rationales to explain why marital status may not impact the association between FSS and memory, as per the quantitative findings reported above: “learning to cope” – participants used other alternatives besides a spouse to deal with memory challenges; “context matters” – contextual factors such as marital satisfaction or the length of marriage can affect the degree of support available from a spouse; and “doing more harm than good” – spouses may provide too much support, reducing participants’ autonomy to stimulate their own cognitive processes. Each theme is discussed in greater detail in the following sections.

5.1 Learning to Cope

Learning to cope was a major theme in several interviews. While many married or common-law participants expressed their appreciation for having a partner to rely on for support and memory challenges, they also explained that in the absence of a partner, they would learn to adapt to their circumstances by seeking other ways of coping with challenges; this sentiment was also shared by nearly all of the unmarried participants. The adaptive coping mechanisms described by participants were generally grouped into two categories: i) using alternative social connections to fill the gaps, and ii) incorporating tangible tools to overcome memory challenges.

5.1.1 Social Alternatives

Some participants said that in the absence of a spouse or common-law partner, they would turn to other social alternatives, such as family or friends, to fulfill their social support needs. For example, Nina, who did not get married until later in life, noted she did not observe any differences in her memory compared to when she was single, mainly due to her ability to leverage other social connections:

“I don't know because I didn't get married until I was like what? 40-something, right? So I have lived all of those lives by myself, and I don't feel like my memory was any worse. I

relied more heavily on my social networks at the time. My friends, my parents, my family, like those kinds of things.” (Nina, 46, married)

Similarly, Diana, who had previously been both married and in a common-law relationship, explained that without a partner, she relies on her family for support, which in turn helps her to remember things better:

“My daughters are really on the ball, and they’ll fill in some details. They’re both bright and I marvel at how they remember details, but then I have to remember. I used to remember details a lot, and ... either I don’t think it’s important or the brain just doesn’t have that flexibility of learning ... Yeah, so I don’t know that I answered the question but it’s like they make up those little deficiencies, and they add those little cues, that support.” (Diana, 64, single)

When asked whether marriage has an impact on the relationship between social support and memory, Lucas disagreed, stating:

“I enjoy being married but I know single people who are more than happy to be single. Like they enjoy being single, or they’ve learned to cope with, you know, this scenario. I know some widows and widowers who are in a great spot because they have a very good social network. I would say a social, a good, sound social network is more, is just as important as a marital social network. So a marital social network is just a variation of a platonic or family, or whatever friendship social network. It’s just I think you’re able to kind of find what you need with a different set of tools.” (Lucas, 58, married)

In fact, some participants emphasized that while marital dissolution is not ideal, most individuals would adapt to these changing circumstances by going into survival mode. For instance, Carmen discussed how after her husband had passed, she got involved in the community and various philanthropic projects to stay connected:

“You’re alone, okay? What do you do? Like I’m alone here. I didn’t go into a depression. I went into fight or flight. I thought, well, if I’m going to survive, there’s so much I can do still. I’ve got to keep busy, right? So that’s what I’ve done to help my memories.” (Carmen, 70, widowed)

Likewise, Lucas noted that marriage is not the sole source of FSS, and it is essential for unmarried individuals to explore other social avenues when spousal support is unavailable:

“I guess necessity is the motherhood of invention. So if you don't have that marital support, you find other avenues of tackling, you know, memory being the component. So you have other tools that you need to do like – hey, let's face it, in order to function in society and in life, you need to kind of find a way how to. You can't completely forget everything all the time, or it's a pretty tough life. So if you're not married, you will find other ways of approaching that memory. It's just that your social support network is different socially with friends and family than it is with marriage. You just find other options. Other ways of doing things. More than one way to skin a cat, right?” (Lucas, 58, married)

Interestingly, Esther commented that although she was widowed, many married individuals in her social network rely on their friends for the majority of their social support, highlighting the complex nature of social connections:

“A lot of people in the circles that I am in get more of their support from the groups that they belong to than they do from their spouse. The spouse has different hobbies than they do. In fact, of the three couples that I hang out with, I hang out with the female, not the couple. So, we give each other support and I just listen to them when they bitch about their partner.” (Esther, 81, widowed)

Gavin even questioned whether single or unmarried/unpartnered individuals may derive more FSS from their surrounding networks than married or partnered individuals:

“I wonder if, when someone is single and dating, their friends are a strong support system and, when the couple gets married, the friends back off because they see that's now an official relationship. So people may lose some of that social support when they marry or become common-law. I wonder if that has an effect on it.” (Gavin, 66, common-law)

Overall, it was evident that in the absence of a spouse (or the absence of sufficient spousal support), individuals can turn to alternative social networks, such as friends or family, to fulfill their support needs through access to emotional or cognitive support.

5.1.2 Other Coping Mechanisms

Besides relying on social connections to address memory challenges, many participants reported using various tangible tools to help jog their memory. Miriam explained that in the absence of a partner to remind them of appointments or tasks, unmarried individuals may have to take extra steps to compensate for memory issues. However, they can still manage effectively on their own by creating lists, setting phone alerts, utilizing task apps, or other reminder techniques:

“If they're self-reliant, independent, then they can use any mechanism to make sure that they remember what they're supposed to. I mean, even putting post-it notes around the house like remember to do this, remember to go here. Simple ways to help them ... if they have trouble remembering medications, then they have to buy one of those things where you've got all the medication out every day and so you know whether you've taken it or not. The same with using a calendar or something to remind yourself. Using alarms or alerts on your cell phone to remind you of appointments and people's birthdays and anniversaries and things too.” (Miriam, 67, married)

However, these compensation strategies were not just limited to single individuals. A key point in several interviews was that, regardless of marital status, both married and unmarried participants employed similar compensation strategies to enhance their memory, emphasizing the importance of self-efficacy and that support from a spouse may not be the only source of memory reinforcement:

“Well, people who are married have a support system, generally, because they have a caregiver who will bring them to things or sign them up for things. Being on your own, you just do what you have to do. I do make a list when I go grocery shopping, but then so do my friends who are married.” (Esther, 81, widowed)

Likewise, Helen noted her marital status did not impact her memory; although she was single, she had an exceptional memory due to her ability to take advantage of the same support tools that her married peers also used:

“In terms of memory, I guess, because whether you're single or you're living with one or more people, we all use the same sort of ... most of us use the same sort of memory aids. Like I just said, the devices, calendars, photographs, records of events, photographic records of events, they'll help you remember who was at different parties and things. You have them whether you're single or married.” (Helen, 79, single)

Taken together, these findings support the notion that coping strategies may come in several different shapes and forms. Regardless of marital status, individuals tend to operate with greater efficacy when leveraging a comprehensive support environment that includes the use of social network members as well as other distinct practical tools like calendars, technological reminders, and lists to enhance memory performance.

5.2 Context Matters

Context matters was another key theme discussed in every interview. Participants highlighted that while marital status alone may not directly influence the association between FSS and memory, contextual factors such as the length of the marriage, prior marital history, and satisfaction with the relationship are all crucial variables to consider because they influence how individuals experience social support and manage their memory. Being in a supportive, fulfilling relationship may enhance memory by providing cognitive support, whereas unsatisfactory relationships, especially those with high stress or emotional distance, can have the opposite effect. More specifically, an emotionally fulfilling relationship was suggested by participants to foster cognitive resilience by promoting a sense of safety, reducing stress, and encouraging positive social interactions that stimulate neural pathways associated with memory and learning. A supportive spouse can also serve as a memory aid, providing reminders for important events, appointments and daily tasks, etc., thereby further enhancing memory retention efforts.

5.2.1 Marital Satisfaction

The role of marital satisfaction in the relationship between FSS, marital status, and memory is important. Several participants emphasized that the quality of their marital

relationships influenced both their cognitive health and overall well-being. Interestingly, among the unmarried participants, many rated their overall satisfaction with their relationship status highly, often giving themselves a score of 9 or 10 on a scale of 1 to 10. In contrast, many married participants reported lower levels of satisfaction, with some rating their satisfaction as an 8 or less.

Several participants, such as Diana, emphasized that marriages or common-law relationships may serve some benefit, but these advantages are not always directly linked to better well-being. Unmarried individuals are not uniformly disadvantaged and, in some cases, may be single by choice. Thus, an individual's feelings about their relationship status should be taken into account:

"I have a number of girlfriends that have been married, and they have zero interest in dating again or zero interest in cohabitating. They are very, very happy on their own. So I think the big thing is, in whatever relationship you're happy in, you sleep better, you eat better, you take care of yourself better, I suspect, and you do the things that make you happy." (Diana, 64, single)

When satisfaction is low, individuals may feel burdened by the responsibilities and stress of their relationships, which can subsequently lead to a decline in memory performance. This burden, especially in unsatisfactory or unequal relationships, can have adverse effects on cognitive function by diverting mental energy away from focusing on personal memory tasks, leading to frustration and forgetfulness. As illustrated by Alice, a low-quality relationship can weaken cognitive processes by not allowing individuals to focus their attention on remembering important tasks and responsibilities due to competing stressors: *"Well, if you're in a bad relationship, marriage or not, you're dealing with stress, so you'll focus on the stress versus other appointments that you have." (Alice, 58, divorced)*

In addition, many participants noted that being in a low-quality relationship often prompted them to seek support from other social network members to fill the gaps left by their partner, further highlighting the previous theme of learning to cope by using social alternatives. This shift can impact memory management, as people may focus on external sources of support rather than relying on their partners. For example, Lucas's reflections highlighted the emotional

weight of an unsatisfactory relationship, noting that even when married, one should feel supported and connected:

“So let's say someone is in an unsatisfactory marriage and, whether it's emotional, mental, or physical strife, whatever, I don't know, but let's say they're not in a scenario where they're happy with their marriage. I think people will tend to find a different social network to fill the void that they're getting from their marital social network. So as an example, a couple is not getting along well. They don't socialize very well. Typically, I would say the majority of people will find either a family member or an outside friend, or whatever, to discuss certain aspects of their life that they normally would have spoken about with their partner, but that's not there, so they find a different outlet to kind of discuss that. So as much as it's great to be married, I don't think it's a have-in and be-all, for memory at least.” (Lucas, 58, married)

Moreover, participants with more complex marital histories or transitions – whether through divorce, remarriage, or long-term relationships – offered unique perspectives on how their experiences influenced their memory. Many participants found that being alone, particularly when their relationships were unsatisfactory, provided them with a greater sense of happiness and fulfillment than their marriages. Therefore, they did not necessarily associate their divorce or separation with a sense of loss. In fact, being alone allowed them to concentrate on their own needs, creating a mental space where they could focus on remembering things for themselves without worrying about a partner’s needs. This reduction in stress helped them feel more in control of their memory. For example, Paula shared how being single allowed her to be solely responsible for herself and her own memory management:

“I find it much easier to keep track of everything for me than to keep track of everything for me and somebody else. And what happens is it's an extra burden, but it's an emotionally taxing burden, and it involves resentment and anger and frustration and becomes a burden. More of a burden, more unpleasant. But do I function any less? Is my memory any worse? I feel that it's high performing whether I'm with somebody or not with somebody, but it's more annoying to have to be high-performing for somebody else and so I feel much better. I feel better about my memory when I only have to remember for myself.” (Paula, 62, divorced)

This sense of personal autonomy was often described as helping improve memory, due to fewer emotional distractions. This suggests that while marriage can offer support, not all marriages should be treated equally. Some marriages may be unfulfilling and the emotional labour of remembering for someone else, as well as the added pressure of an unhappy relationship, can interfere with cognitive function by increasing stress and decreasing the mental energy available for memory tasks. Being single allowed some participants to feel less stress, ultimately letting them focus on their own memory and reducing the cognitive burden that sometimes comes with managing a relationship.

5.2.2 Marital History

The length of a marriage or partnership may also play a critical role in the association between FSS, marital status, and memory, though it interacts with factors such as marital satisfaction. Long-term marriages may offer stability, but they can also present challenges that affect memory. More specifically, participants suggested that the familiarity and continuity offered by a long-term marriage may support their memory retention. Peter, reflecting on his long-term marriage, acknowledged the benefits of shared experiences and the comfort of a long-term partner, noting that having the same partner for many years helped with his memory:

“We talk about stories from when we got married, and stories before we got married. Certainly, she has her own childhood stories, and I have my own childhood stories ... we always talk about those things so that certainly helps remember things of the past. So, in terms of long-term memory, certainly talking about such things helps greatly ... I mean, if I was married to three or four women, one after the other, probably I wouldn't remember even a single thing that happened ... While I'm talking to you, I realize that probably helps, being married to the same person.” (Peter, 70, married).

However, a longer duration of marriage is not always a straightforward benefit. As reiterated by many participants, a longer marriage does not necessarily imply greater “togetherness”. Over time, both physical separation and emotional distance can make a long marriage feel less supportive, possibly diminishing its positive impact on cognitive support. In this way, the longevity of a marriage does not necessarily guarantee the positive influence on

memory that one might expect, as the quality of that connection over time matters deeply. For example, Carmen explained how her relationship dynamics changed drastically as her husband started working away for extended periods, ultimately altering the intimacy of their 40-year marriage:

“Well, he wasn't perfect. After 40 years, I can say that. I wasn't perfect, he wasn't perfect, and at the end, the last I'd say 7 or 8 years before he passed in 2016, we were basically just friends because he worked in Fort McMurray, Alberta. So he flew in and flew out every two weeks ... It changed the whole dynamic of our relationship. So it was tough. It was very tough, but I think it was a precursor ... I think God was getting me ready to be on my own.” (Carmen, 70, widowed).

These nuances suggest the role of marital status in cognitive health is not straightforward, but rather deeply affected by the broader relational contexts in which it exists. Factors such as physical separation, emotional closeness, communication patterns, and marital history all play crucial roles in shaping how relationships influence cognitive function.

5.3 Doing More Harm than Good

Another key theme in the interviews was the potential downside of excessive support from spouses, which may inadvertently *do more harm than good* by limiting an individual's cognitive autonomy and capacity to engage in mental stimulation. Some participants expressed that when one partner consistently handles tasks or decision-making, the other may become less inclined to exercise their own cognitive abilities, potentially accelerating cognitive decline. As one participant reflected about his partner:

“I know she's there as a support that way, but I don't want to rely on that too much because I suspect that's one of the things with my father that made his dementia worse. My mother did that for him. She passed away many years ago, and we noticed the dementia getting worse then, but she covered for him. You probably run across that before dementia too, a spouse covers for the other without realizing they're covering. They're just helping. But we didn't realize how bad his dementia was while she was there ... he tagged along beautifully but I think he was forgetting these things, and he just

didn't say I forgot. He just went with her. My mother just made sure it happened. Food would show up. They would do what they needed to. She ran that, and I think that really too much support can add to the dementia because you're not letting the person exercise their own memory over time.” (Gavin, 66, common-law)

Miles, who had been an informal caregiver for several individuals with dementia, including his mother, also cautioned about providing too much support and restricting one’s autonomy: *“The trick is to convince the person who's being the helpful Henry to do it right ... Don't overdo being a caregiver, don't coddle the person too much, things like that. You have to teach them to be independent, so don't overdo it.” (Miles, 70, divorced)*

One participant argued that, as a single person, she has had to consistently think on her feet and find alternative strategies to remember things. In fact, this constant engagement may actually further stimulate her mental processes compared to couples who are co-dependent on each other for support and who might struggle to cope independently:

“Especially when my husband left, I basically ... it's like nobody's coming to rescue you. You just need to do this. So buckle down, figure it out and do it. Just do it. So there does come from that a sense of power and self-determination that ... I mean, I looked back and went, wow! You handled that really well. Like I didn't take grief leave, I just had to battle on through, and I was very successful at it ... Put it this way, your brain just has to stay that much stronger. I think you have to push yourself and challenge yourself more when you're on your own. Like I find my mom relies a lot on my dad.” (Diana, 64, single)

These concerns highlight that, while marital support can be beneficial, there is a delicate balance between providing support and fostering independence – one that, if disrupted, could have unintended consequences on cognitive health. As suggested by Gavin, over-support may limit mental exercise and, consequently, affect memory functioning in the long run:

“I seriously wonder about that, all the assistance my mother gave to my father, if that really added to it ... you know, the brain is, if you don't exercise it, attributes do fade. Whether it's memory, whether it's ... you know, I learned calculus when I was in university. I haven't used it since. I don't remember how to do calculus, but I know I could pick it up again if I needed to. But yeah, I didn't use it, so it's gone for now. And my

dad never had to use his memory because my mother always did it for him so I think that might be something to look at – the fact that if you have someone that does too much for a spouse, they could be harming them.” (Gavin, 66, common-law)

Taken together, although spousal support can serve many benefits for cognitive health, it should be provided in moderation. Excessive support, particularly when it involves taking on too much responsibility for others’ needs, can be detrimental to memory, as participants noted that too much assistance may reduce individuals’ cognitive autonomy, not allowing them to sufficiently stimulate their mental processes.

Chapter 6

Discussion

This chapter situates the findings of the thesis within the broader context of the existing literature and focuses on the integration of the quantitative and qualitative results. More specifically, I highlight how the qualitative themes in Chapter 5 provide context and explanations for the quantitative findings in Chapter 4 (Figure 14). The quantitative and qualitative results suggest that while greater FSS is associated with better memory, marital status may not have an impact on this association. Additionally, I conclude with a discussion of the strengths and limitations of the thesis, as well as future directions for research and implications.

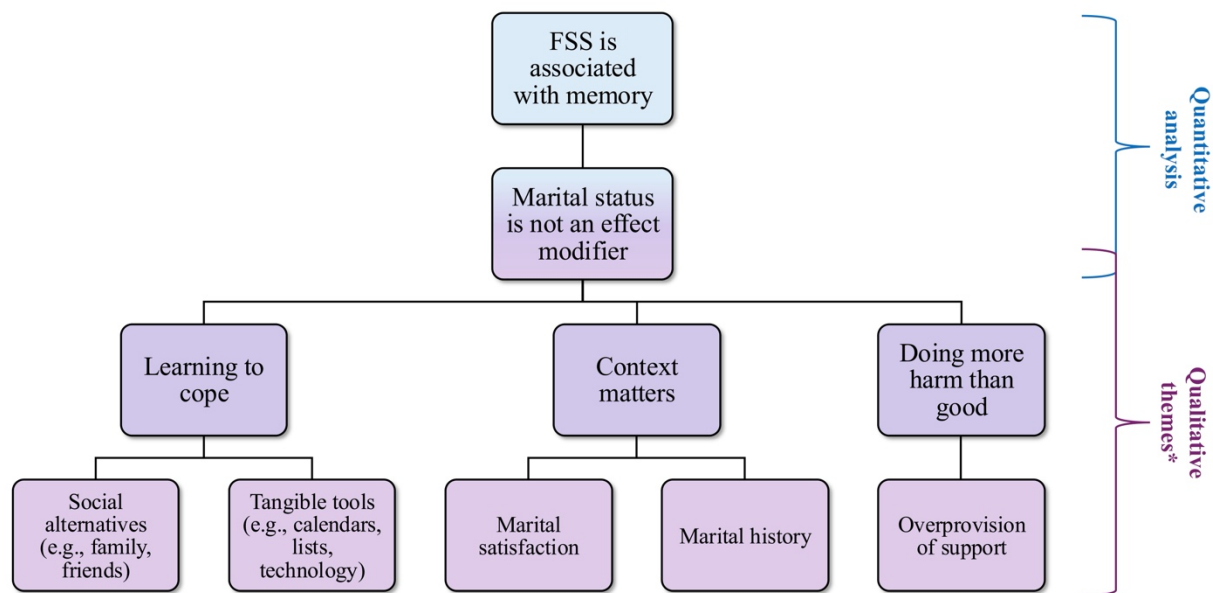


Figure 14. Joint Display Diagram Integrating the Quantitative and Qualitative Findings

*Qualitative themes explain why marital status is not an effect modifier of the association between FSS and memory

6.1 Quantitative Findings

In the quantitative study, FSS was found to have a positive association with memory among a cohort of middle-aged and older Canadians. However, this association was not modified by marital status, regardless of whether effect modification was assessed by using an

FSS*marital status interaction term or stratifying the sample by baseline marital status. Examination of these associations using different missing data approaches (i.e., complete case analysis, multiple imputation, and missing data category) yielded similar results.

6.1.1 Association between FSS and Memory

The main findings regarding FSS and memory are consistent with earlier analyses of the CLSA, which also reported significant positive associations between FSS and both immediate and delayed recall memory (9,74). Ohman et al.'s (2022) cross-sectional analysis of the relationship between FSS and memory found adjusted β s in the range of 0.02 to 0.07, whereas Yoo et al.'s (2023) analysis of three-year change scores in memory reported adjusted β s in the range of 0.03 to 0.07; the findings of both studies match the fully adjusted regression coefficients in this thesis (range: 0.04 to 0.07) (9,74).

The thesis results are also generally consistent with previous research conducted using samples drawn from other populations (7,25,73). For example, Ge et al. (7) found significant positive associations between FSS and both episodic and working memory in a sample of 3159 older adults from the Population Study of Chinese Elderly in Chicago (PINE). Similarly, in their examination of 1091 older adults from the Lothian Birth Cohort, Gow et al. (25) found that greater perceived social support was associated with better memory performance. Moreover, in their examination of 838 older adults from the Rush Memory and Aging Project, Krueger et al. (73) reported that perceived social support was positively associated with working memory. However, while these studies, as well as several systematic reviews (43,50,71), generally support a positive association between FSS and memory, it is important to note that the evidence is not uniformly positive. In fact, a recent review by Mogic et al. (71) found that of the 17 articles that have examined the association between FSS and memory, only 21 positive associations were identified, whereas 9 negative or null findings were reported. For instance, Zuelsdorff et al. (129) found no significant association between FSS and immediate, verbal, or working memory in a sample of 623 individuals with a family history of Alzheimer's disease. Zuelsdorff et al. used the same measures of FSS (i.e., the MOS-SSS) and memory (i.e., the RAVLT) as the current study, though key methodological differences between their work and the thesis may account for the

divergent findings. For example, Zuelsdorff et al. relied on cross-sectional data from a single timepoint, and had a smaller, younger, and predominantly female sample, all of which may have contributed to their differing results. Conversely, a study by Sims et al. (62) found negative associations for tangible support and positive social interactions with nonverbal recall memory in a sample of 175 community-dwelling older adults from Baltimore, Maryland. However, their strict exclusion criteria (i.e., excluding individuals with a history of chronic conditions such as diabetes, cardiovascular disease, stroke, mental illness, or high alcohol consumption), in combination with the use of fewer covariates, different measures of memory and FSS, smaller sample size, and cross-sectional study design may have contributed to these discrepant findings.

Turning to the covariates utilized in the thesis, the results of the descriptive analyses and the directions of effect for these variables in the regression models are consistent with previous literature (see Tables 8 and 10). For example, the thesis found a negative association between age and memory, indicating that older adults tend to have poorer memory; this finding aligns with the literature (10,153–155). Additionally, consistent with previous research (153,156,157), female participants reported better memory than their male counterparts. The findings also showed positive associations between different indices of socioeconomic status, such as education and income, and memory performance, which is also supported by existing literature (153,158,159). Moreover, higher levels of depressive symptoms were negatively associated with memory in the analytical sample, aligning with other studies in the field (153,160–162). Taken together, the alignment of these findings with previous research supports the validity of the thesis results.

6.1.2 Effect Modification by Marital Status

The findings of the quantitative study also suggested that the association between FSS and memory did not significantly differ between married or common-law, WDS, or single individuals. Although this does not support my initial hypothesis, it is consistent with the findings from my aforementioned systematic review (19), which generally found positive, though statistically non-significant, associations between FSS from a spouse/partner and memory in the included articles. In contrast to the null findings, Liao and Scholes (22) found that higher

levels of FSS from a spouse/partner were significantly associated with lower baseline memory in women and a slower rate of memory decline for both sexes. However, when setting the thesis results in the context of the articles included in the systematic review, the current study had a larger sample size and controlled for a greater number of covariates, potentially providing a more accurate estimation of the true effect of marital status on the association between FSS and memory. Additionally, none of the articles in the systematic review (including Liao and Scholes) specifically explored whether marital status modified the association between FSS and memory. Instead, these studies examined whether spousal support, in comparison to support from other sources such as children or friends, may differentially impact memory, suggesting that my main research question was unanswered and ripe for exploration in this thesis.

My findings are also supported by a recent study by Lee and Jiang (119), which explored whether FSS, measured using a 12-item questionnaire adopted from the Health and Retirement Study (163), moderated the association between widowhood and episodic memory among older Chinese immigrants. Similar to my approach, Lee and Jiang (119) employed an interaction term to assess the joint effect of social support and widowhood on episodic memory. They used the married group as the reference category. Like the current thesis, none of Lee and Jiang's interaction terms were statistically significant. However, unlike the novel approach taken in this thesis, they excluded individuals who were divorced, separated, or never married from their analytical sample.

While my findings suggest some support for the stress-buffering hypothesis linking FSS and memory, the lack of statistical significance for the moderating effect of marital status seems inconsistent with this theory. The hypothesized expectation was that FSS from a spouse would provide an additional source of coping assistance and thereby increase stress-buffering effects, compared to persons who were not married or in common-law relationships. More specifically, as discussed in Section 2.7 above, I hypothesized that the frequent and regular interactions between spouses in married or common-law relationships may provide a steady source of FSS, which in turn may ameliorate life stressors and protect against memory decline compared to the potentially distant or irregular sources of support received by unmarried individuals. As such, the association between FSS and memory was expected to be stronger for married or common-law individuals compared to WDS or single individuals. However, as illustrated below in the

discussion of the qualitative findings, several reasons explain the absence of effect modification by marital status.

6.2 Qualitative Explanations

Although some earlier quantitative studies investigated the influence of marital-related variables on the association between FSS and memory (13,20–22), no previous qualitative studies prior to the work in this thesis were undertaken to explore the specific underlying mechanisms involved in the relationship between these three variables. Three key themes emerged to help explain why the association between FSS and memory may not differ by marital status. These themes included: (1) learning to cope in the absence of a spouse, (2) the importance of considering contextual factors, and (3) the potential for excessive support from spouses to hinder participants' ability to stimulate their own cognitive processes.

6.2.1 Learning to Cope

The findings support the notion that, regardless of marital status, individuals tend to operate with greater mental capacity when leveraging a comprehensive, supportive environment that includes the use of social network members as well as practical tools like calendars, technological reminders (e.g., apps such as TickTick or Todoist), and written lists or sticky notes to enhance their memory performance. Conceptualizing individuals' memory function within an ecological framework that incorporates both social and material support systems may have important implications for understanding the everyday competencies of middle-aged and older adults (164). Memory compensation encompasses a range of intra-individual and extra-individual resources that persons use to mitigate changes in their cognitive ability and reduce the impact of memory difficulties on daily functioning (165).

Previous research has found that practical tools are the most frequently reported memory compensation resources used by older adults, and reliance on one's spouse is the least reported source of compensation, even among couples in long-term marital relationships (164). The use of external memory compensation tools has been consistently linked with better cognitive function,

specifically memory, in older adults (166,167). As suggested by many of the qualitative participants, individuals may leverage such resources to improve or maintain their cognitive functioning, regardless of their marital situation, potentially explaining the absence of a moderating effect for marital status in the association between FSS and memory.

Additionally, according to Penning and Wu (15), unmarried individuals who cannot derive FSS (e.g., emotional support) from a spouse may compensate for the absence of a spouse by actively restructuring their support networks to ensure they have sufficient FSS available from other close-knit network members. For example, single individuals report receiving more emotional support than married or cohabitating individuals (15), and are more likely to interact with, provide help to, and receive help from parents, siblings, children, extended family, neighbours and friends. These findings were echoed by several qualitative participants who expressed that many members of their social network rely more on friends for support, rather than their spouses. Therefore, although marriage is one source of support, close-knit relationships with other members of one's social circle may also generate support. This compensatory mechanism for unmarried adults may help explain the lack of evident differences across marital status categories in the quantitative results.

6.2.2 Context Matters

Many qualitative interviewees highlighted the complicated nature of 'marital status'. More specifically, they shared detailed accounts of their marital histories, noting various transitions between marital status categories over time (e.g., from married to divorced). Their collective marital histories provided them with a unique perspective on the topic, allowing them to compare their experiences of social support and memory at various points in their lives. This contradicts traditional views of marriage among researchers, who have viewed marital dissolution as a linear transition that inevitably leads to divorce (168). However, marital relationships can often be complex and dynamic, following intricate trajectories such as divorce and remarriage or separation and reconciliation. Notably, several participants described how changes in their marital status directly influenced the support they received and their experiences with memory, suggesting a more nuanced interplay than was captured in the quantitative data.

The quantitative study, which utilized data from the CLSA, did not capture this complexity as it only gathered information on participants' marital status using a single question: "*What is your current marital/partner status?*". This 'surface-level' data about participants' marital status may not have yielded significant associations in the relationship between FSS, marital status and memory because it lacks the depth necessary to truly encapsulate the cumulative and evolving nature of marital experiences over time.

Participants expressed varying levels of satisfaction with their marital status, which may help explain differences in health outcomes, particularly in relation to cognitive functioning and memory. More specifically, some married participants were unhappy in their relationships, whereas some single individuals reported they were highly satisfied with not having a partner. These findings further support previous research stating that unmarried people are not uniformly disadvantaged and, in some cases, may have better health outcomes than those who are unhappily married (109). For instance, divorce ending a toxic or abusive marriage may improve one's cognitive health by alleviating stress, whereas the continuation of such a marriage could adversely affect cognition due to the maintenance of stress (107). In fact, some scholars argue that satisfaction with one's marital status is more salient for health than marital status itself (169). Indeed, marital satisfaction has been linked to both social support (170) and memory (171,172). Thus, it is possible that marital status may impact the association between FSS and memory differently for individuals who are satisfied versus dissatisfied with their current relationship status. A key limitation of the quantitative study is that the CLSA did not collect data on marital satisfaction, making it unfeasible to account for this variation in the analysis. As a result, measuring marital status alone may have overlooked these nuanced differences and failed to yield any significant associations.

Unfortunately, many quantitative studies exploring the health impacts of marital status do not measure key variables such as marital satisfaction or the length of marriage. None of the studies included in the systematic review measured these variables. Qualitative methodologies, especially those that emphasize the importance of lived experience, can illuminate parts of marital relationships that are not captured in quantitative research. More specifically, given the scarce empirical work in this area, obtaining purposeful samples of both married/partnered and unmarried/unpartnered, community-dwelling adults may provide meaningful insights into the

link between FSS, memory and marital-related variables, ultimately generating greater understanding than what quantitative analysis alone may provide.

6.2.3 Doing More Harm than Good

The findings suggest that while marital status may not moderate the relationship between FSS and memory, the amount of support received from spouses can play a critical role in cognitive outcomes. One key qualitative theme was that excessive FSS from a spouse – often referred to as *overprovision* – may not always be beneficial and, in some cases, can actually hinder cognitive functioning. Previous research has suggested that the relationship between social support and cognitive health may be non-linear (13,173). Indeed, past a certain threshold, high levels of FSS can potentially undermine self-efficacy (174) and foster dependency (175,176), both of which may lead to increased stress and, in turn, negatively impact memory performance. In addition, when a spouse provides excessive assistance – whether by anticipating needs too frequently or taking on tasks the other partner might prefer to handle independently – this may limit the individual's opportunity to exercise their own cognitive processes. In line with the 'use-it-or-lose-it' theory (92), this lack of cognitive stimulation could lead to less efficient use of neural networks, potentially contributing to declines in memory function over time. Overprovision of support can also introduce additional stressors into a relationship (170), contributing to greater declines in marital satisfaction, which has been shown to negatively affect cognitive function (177–180). Therefore, excessive support can directly impact cognitive function by hindering mental engagement and indirectly impact cognition by reducing marital quality through heightened conflict, stress, or lack of autonomy.

The underprovision of FSS from a spouse can also undermine coping efforts; however, these effects may be buffered if support is available from individuals outside the marriage (170), such as family members or friends, as noted by many participants (see Section 5.1.1 and 6.2.1 above). However, when excessive FSS is provided by a spouse, this external support does not offer the same protective effect, suggesting that the negative impact of overprovision cannot be buffered in the same way. Taken together, these findings suggest the relationship between FSS, marital status and cognitive outcomes, particularly memory, is far more complex than the simple

presence or absence of support. The thesis emphasizes the complex interplay between relationship dynamics and memory, and underscores the importance of understanding that individuals have unique support needs. More frequent support is not always preferable and may sometimes create a dynamic where well-intentioned support from a spouse could have unintended, adverse consequences for cognition.

6.3 Strengths and Limitations

6.3.1 Quantitative Phase

With the current aging population in Canada, it is important to investigate potentially modifiable factors to promote healthy cognitive function (50). The current study addresses several gaps in the literature, helping to develop a better understanding of how marital relationships may affect the association between FSS and memory. As previously discussed, little research has focused on marital-related variables, FSS and memory simultaneously. I focused on the memory domain of cognitive function specifically because it is highly impacted by aging and central to the processes that contribute to social interactions, which are important in maintaining emotional well-being and helping individuals construct a sense of meaning in their lives (47). Furthermore, to my knowledge, no published studies have examined whether marital status acts as an effect modifier of the association between FSS and memory. To date, the current study is the first and only one to assess effect modification using longitudinal data from a large-scale national study.

The seminal nature of the thesis topic benefited from the breadth and depth of the CLSA as a research platform. The CLSA's follow-up 2 timepoint included data from over 14,000 middle-aged and older, community-dwelling persons drawn from across Canada's 10 provinces. In addition, these participants provided a wealth of sociodemographic, health, and lifestyle data to permit adjustment for a series of important potential confounders. Compared to the four articles included in the systematic review (19), the current study adjusted for the greatest number of covariates, all of whose inclusion in the regression models was supported by the literature (7,21,22,24,72,74). The consideration of multiple facets of FSS served as another strength of this

study compared to other research, which typically focused on overall FSS or one or two FSS subtypes.

Furthermore, most studies examining the impact of marital relationships on health often dichotomize marital status into two groups: married/partnered or unmarried/unpartnered. The unmarried group encompasses all individuals who are single, never married, divorced, separated, or widowed. However, such categorization may obscure important inter-group differences between those who are not married. More specifically, WDS individuals may share very diverse and unique experiences compared to those who were never married, due to the grief and stress associated with losing a loved one or the dissolution of a long-term relationship. Therefore, given the distinct experiences of individuals within each of these marital groups, another strength of this study is its examination of different marital status categories and their impact on the relationship between FSS and memory. More specifically, WDS individuals were analyzed separately from single individuals to address the possible differences between persons in these two kinds of relationships.

Some limitations are also noted for the thesis, specifically with regards to sample characteristics, measurement constraints, and methodological design. For instance, the CLSA sample used in this study was likely affected by volunteer bias since participants generally reported high levels of FSS and were predominantly married or in common-law relationships; this trend aligns with findings from previous research as well (74). This could have led to overestimates of positive associations between FSS and memory in the regression models. Furthermore, most participants' marital status was stable across the three timepoints; hence, I was unable to assess the impact of changing marital status on FSS and memory. I also did not have access to information about the precise time when the death of a spouse or the dissolution of a marriage occurred; thus, I could not account for time in the analyses. Additionally, the CLSA excluded persons who showed overt signs of cognitive impairment at the baseline recruitment interview, which could bias associations away from the null (i.e., overestimation). Therefore, considering the selection biases inherent in the CLSA data, the findings on the association between FSS, marital status, and memory should only be applied to populations who mirror the analytical sample, not to the overall CLSA sample or to the target population from which the CLSA sample was drawn.

Lastly, this thesis did not explore bidirectional associations between FSS and memory. Previous research suggests that individuals with poor memory may experience reductions in social engagement and support over time (181). More specifically, social participation and maintenance of social networks require complex cognitive abilities to engage with others in one-on-one or group settings. However, when older adults experience cognitive decline, they may no longer be able to retain or keep track of details during conversations, or even leave their residences. This can lead to withdrawal from social participation and consequent shrinkage of social networks, resulting in a loss of social support.

6.3.2 Qualitative Phase

This study is the first to examine the relationships between FSS, marital-related variables, and memory using qualitative methodology. Previous qualitative research investigated the marital experiences of spousal caregivers of individuals with memory loss disorders, such as dementia (182–185), but no studies specifically explored the questions raised in the thesis. This highlights a critical gap in the literature – to explore how social and marital relationships influence memory in middle-aged and older adults without existing neurocognitive disorders – a gap that this study addresses.

Another key strength of this study is the inclusion of both middle-aged and older adults, providing a broader perspective that is often overlooked in studies focusing on single age groups. Furthermore, by interviewing individuals with a diverse range of marital statuses, including those in common-law relationships – who are frequently underrepresented in marital research – I was able to capture a wide range of perspectives, enhancing the applicability of the findings.

However, the aim of the qualitative study was not to provide a generalizable overview of the thoughts and opinions of all community-dwelling adults, but to describe the experiences of a sample of middle-aged and older Canadians who closely resembled CLSA participants, with the intent of helping to explain and contextualize the findings of the quantitative study. Therefore, the experiences of the qualitative participants may not represent individuals from different geographical regions or age groups. Additionally, my sample primarily consisted of heterosexual participants. To deepen our understanding of the complexities of social relationships and

cognitive outcomes across various demographic groups, it is essential to explore the experiences of non-heterosexual couples in this context.

In addition, as with any study relying on self-selection for participant recruitment, the potential for volunteer or selection bias is present in the qualitative sample. Participants were recruited through posters, advertisements, and snowball sampling, which may have attracted individuals who were healthier, more engaged, and more willing to participate in research. Additionally, those who were more open to discussing their marriages or marital histories may have been more likely to self-select, potentially influencing the nature of the data collected. My sample was also predominantly composed of individuals who were married or in common-law relationships, which further raises the possibility of selection bias. However, this may not necessarily be a limitation given that the goal was to reflect the demographic characteristics of the CLSA sample, which also consisted of a higher proportion of married and common-law individuals. Furthermore, although the sample size may appear relatively small, it is comparable to other qualitative studies in the marital literature (168,186,187), which often use similar sample sizes to explore in-depth personal experiences and provide rich, context-specific insights.

Lastly, as with all qualitative research, participants' narratives were shaped by how they remembered and made sense of their experiences. Understandably, some participants' reflections of their marital relationships and memory may have been influenced by the challenges of recalling past events or by the meanings they currently attach to those events. While the possibility exists that individuals may present themselves in a more 'socially acceptable' way, many participants offered candid and nuanced accounts of their marital experiences, including expressions of dissatisfaction or conflict in their relationships. For example, when discussing marital satisfaction, some participants openly described being unhappy in their current or previous relationships, suggesting that social desirability likely played a minimal role in shaping responses. Additionally, while I sought to create a supportive, open environment during the interview process and establish trust with the interviewees, the co-constructed nature of qualitative interviews means that the framing of questions may have influenced the focus or tone of some responses. Nonetheless, the depth and honesty evident across the interviews suggest that participants felt comfortable sharing their perspectives, even when these were complex or difficult to articulate.

6.4 Implications and Future Directions

In conclusion, the findings in the thesis support the notion that a comprehensive approach should be taken when exploring how various dimensions of social relationships may influence cognitive trajectories. Given the nuances of marital histories, future research should include contextual marital variables – such as length of marriage, satisfaction with one’s marital status, and support adequacy – in analyses of the link between marital relationships, social support and cognitive function. Incorporating these contextual measures into longitudinal panel studies, such as the CLSA, may provide meaningful insights into the quality of social relationships, helping researchers take a more comprehensive approach to examining social determinants of health. For example, research on the length of marriage might show how the cumulative effects of long-term relational dynamics impact cognitive trajectories. Similarly, future studies on the effects of complex marital histories could provide important insights into how relationship state transitions, such as from divorce to remarriage, impact cognitive health. By considering these contextual factors, future studies can more holistically assess complex links between marital status and cognitive function across the life course.

As social networks diminish in size in later life and intimate partnerships become more central, the findings of the current thesis can inform public health initiatives by highlighting that fostering strong social connections (e.g., through community engagement activities) could be an effective strategy for promoting cognitive health in middle-aged and older adults. The present study found that marital status did not impact the association between FSS and memory. Therefore, while we do not have evidence to recommend targeted social support interventions based on one’s marital status as a means of enhancing memory, an impetus still exists for the healthcare system to provide the means for familial caregivers (spousal or not) to satisfy the unmet social support needs of persons with memory impairment (188). This thesis challenges the conventional notion that marriage is a means of enhancing social support and improving cognitive health. Contrary to previous research, my findings highlight that unmarried individuals are not necessarily at a disadvantage. Rather, unmarried persons can find alternative avenues for fulfilling their social support needs, such as cultivating relationships with friends, family, or

children to stimulate their mental processes. These insights open new possibilities for supporting cognitive health, particularly in populations that may not be married or in traditional partnerships. For instance, social prescribing may offer a tangible way to connect unmarried individuals to the appropriate resources they need to address gaps in FSS. Social prescribing is a program where physicians and allied health professionals formally incorporate social engagement and activities into a patient's treatment plan by referring them to local services tailored to their specific interests and goals (189). Examples include participating in book clubs, joining a bereavement network, or taking art classes with peers. Empirical evidence suggests that social prescribing can decrease the frequency of primary care and emergency department visits, reduce secondary care referrals, enhance psychological well-being, reduce anxiety, feelings of loneliness and social isolation (190,191). Therefore, raising awareness of, and access to, supportive resources through social prescribing may improve cognitive health among aging populations by connecting individuals to services that, in most cases, are already available in their communities.

Additionally, the thesis findings highlighted the importance of not only considering the presence of support, but also evaluating its appropriateness and balance. As previously mentioned, overprovision of FSS may inadvertently limit opportunities for individuals to engage in cognitive stimulation, which can undermine their self-efficacy and promote dependence. This underscores a crucial implication for future interventions to focus on fostering diverse and resilient support networks that extend beyond a single individual, while also providing spouses with guidance on how to offer support in ways that maintain autonomy and encourage cognitive engagement. Health professionals and public health messaging (e.g., wellness newsletters) could encourage simple, autonomy-respecting approaches to care (e.g., encouraging a partner to start journaling to track recent events, participation in social or group activities, and the pursuit of personal hobbies and interests) to help partners understand the delicate balance between being helpful and providing too much assistance. Furthermore, enhancing access to FSS from a broader range of social network members beyond the marital dyad may help prevent overreliance on a single partner, leading to more even and sustainable distribution of care, ultimately reducing the caregiving burden on the spouse.

Taken together, the thesis illustrates the complementary strength of using a mixed-methods approach to develop a better understanding of how social relationships affect cognitive trajectories in aging populations. My systematic review established the current state of the literature on this topic and identified gaps for further investigation. My quantitative analysis found that the association between FSS and memory was not modified by marital status. However, the qualitative findings illuminated several potential explanations for the quantitative finding. First, unmarried individuals may rely on alternative sources of FSS, such as family and friends, to fulfill their support needs without the necessity of marital relationships. Second, contextual factors play a crucial role in understanding the association in question, as the quantitative study did not account for marital satisfaction or marital history, which may influence the quality and impact of marital support on FSS and cognitive health. Lastly, participants suggested that excessive FSS from a spouse could have detrimental effects on cognition, highlighting the possibility of an inverted U shape in which extending beyond a certain threshold of FSS may lead to cognitive overload or stress. The mixed-methods approach undertaken for this thesis allowed for a more nuanced interpretation of the quantitative findings, shedding light on the underlying mechanisms and contextual factors that contributed to the statistical results. In addition, the thesis allowed us to gain a better understanding of how both married and unmarried individuals can meet their social support needs in ways that are not immediately apparent from statistical trends, as well as uncover the personal, situational, and behavioural factors that explain why certain individuals thrive in non-marital social networks.

References

1. Prince JB, Davis HL, Tan J, Muller-Townsend K, Markovic S, Lewis DMG, et al. Cognitive and neuroscientific perspectives of healthy ageing. *Neurosci Biobehav Rev.* 2024;161:105649.
2. Onedera JD, Stickle F. Healthy aging in later life. *Fam J.* 2008;16(1):73–7.
3. Szychowska A, Drygas W. Physical activity as a determinant of successful aging: a narrative review article. *Aging Clin Exp Res.* 2022;34(6):1209–14.
4. Craik FIM, Rose NS. Memory encoding and aging: A neurocognitive perspective. *Neurosci Biobehav Rev.* 2012;36(7):1729–39.
5. Tuokko H, Griffith LE, Simard M, Taler V. Cognitive measures in the Canadian Longitudinal Study on Aging. *Clin Neuropsychol.* 2017;31(1):233–50.
6. StatsCAN Plus. Alzheimer's Awareness Month [Internet]. 2024. Available from: <https://www.statcan.gc.ca/o1/en/plus/5374-alzheimers-awareness-month#shr-pg-pnl1>
7. Ge S, Wu B, Bailey DE, Dong X. Social support, social strain, and cognitive function among community-dwelling U.S. Chinese older adults. *J Gerontol A Biol Sci Med Sci.* 2017;72(suppl_1):S16–21.
8. Hughes TF, Andel R, Small BJ, Borenstein AR, Mortimer JA. The association between social resources and cognitive change in older adults: Evidence from the Charlotte County Healthy Aging Study. *J Gerontol B Psychol Sci Soc Sci.* 2008;63(4):P241–4.
9. Ohman A, Maxwell CJ, Tyas SL, Oremus M. Subtypes of social support availability are not differentially associated with memory: A cross-sectional analysis of the Comprehensive Cohort of the Canadian Longitudinal Study on Aging. *Aging Neuropsychol Cogn.* 2023;30(3):354–69.

10. Seeman TE, Miller-Martinez DM, Stein Merkin S, Lachman ME, Tun PA, Karlamangla AS. Histories of social engagement and adult cognition: midlife in the U.S. study. *J Gerontol B Psychol Sci Soc Sci*. 2011;66 Suppl 1:i141–52.
11. Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. *Psychol Bull*. 1985;98(2):310–57.
12. Sandi C. Memory impairments associated with stress and aging. In: Bermúdez-Rattoni F, editor. *Neural plasticity and memory: From genes to brain imaging*. Boca Raton, FL: CRC Press; 2007. p. 225–64.
13. Zahodne LB, Ajrouch KJ, Sharifian N, Antonucci TC. Social relations and age-related change in memory. *Psychol Aging*. 2019;34(6):751–65.
14. Shapiro A, Keyes CLM. Marital status and social well-being: Are the married always better off? *Soc Indic Res*. 2008;88(2):329–46.
15. Penning MJ, Wu Z. Marital status, childlessness, and social support among older Canadians. *Can J Aging*. 2014;33(4):426–47.
16. Aartsen MJ, Van Tilburg T, Smits CHM, Comijs HC, Knipscheer KCPM. Does widowhood affect memory performance of older persons? *Psychol Med*. 2005;35(2):217–26.
17. Mousavi-Nasab SMH, Kormi-Nouri R, Sundström A, Nilsson LG. The effects of marital status on episodic and semantic memory in healthy middle-aged and old individuals. *Scand J Psychol*. 2012;53(1):1–8.
18. Liu H, Zhang Y, Burgard SA, Needham BL. Marital status and cognitive impairment in the United States: Evidence from the National Health and Aging Trends Study. *Ann Epidemiol*. 2019;38:28-34.e2.
19. Haghighi P, Oremus M. Examining the association between functional social support, marital status, and memory: A systematic review. *BMC Geriatr*. 2023;23(1):290.

20. Windsor TD, Gerstorf D, Pearson E, Ryan LH, Anstey KJ. Positive and negative social exchanges and cognitive aging in young-old adults: Differential associations across family, friend, and spouse domains. *Psychol Aging*. 2014;29(1):28–43.
21. Scholes S, Liao J. Social support, social strain and declines in verbal memory: Sex-specific associations based on 16-year follow-up of the English Longitudinal Study of Ageing cohort. *Aging Ment Health*. 2022;1–9.
22. Liao J, Scholes S. Association of social support and cognitive aging modified by sex and relationship type: A prospective investigation in the English Longitudinal Study of Ageing. *Am J Epidemiol*. 2017;186(7):787–95.
23. Harasemiw O, Newall N, Shooshtari S, Mackenzie C, Menec V. From social integration to social isolation: The relationship between social network types and perceived availability of social support in a national sample of older Canadians. *Res Aging*. 2018;40(8):715–39.
24. Hülür G. Structural and functional aspects of social relationships and episodic memory: Between-person and within-person associations in middle-aged and older adults. *Gerontology*. 2022;68(1):86–97.
25. Gow AJ, Corley J, Starr JM, Deary IJ. Which social network or support factors are associated with cognitive abilities in old age? *Gerontology*. 2013;59(5):454–63.
26. Sherbourne CD, Stewart AL. The MOS social support survey. *Soc Sci Med*. 1991;32(6):705–14.
27. Berkman LF, Syme SL. Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda County residents. *Am J Epidemiol*. 1979;109(2):186–204.
28. Hajek A, Brettschneider C, Eisele M, Mallon T, Oey A, Wiese B, et al. Social support and functional decline in the oldest old. *Gerontology*. 2022;68(2):200–8.
29. Freak-Poli R, Ryan J, Neumann JT, Tonkin A, Reid CM, Woods RL, et al. Social isolation, social support and loneliness as predictors of cardiovascular disease incidence and mortality. *BMC Geriatr*. 2021;21(1):711.

30. Vaingankar JA, Abdin E, Chong SA, Shafie S, Sambasivam R, Zhang YJ, et al. The association of mental disorders with perceived social support, and the role of marital status: results from a national cross-sectional survey. *Arch Public Health*. 2020;78(1):108.
31. Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: a meta-analytic review. *PLoS Med*. 2010;7(7):e1000316.
32. Berkman LF, Glass T, Brissette I, Seeman TE. From social integration to health: Durkheim in the new millennium. *Soc Sci Med*. 2000;51:843–57.
33. Rosengren A, Wilhelmsen L, Orth-Gomér K. Coronary disease in relation to social support and social class in Swedish men: A 15 year follow-up in the study of men born in 1933. *Eur Heart J*. 2004;25(1):56–63.
34. Harding BN, Hawley CN, Kalinowski J, Sims M, Muntner P, Young BA, et al. Relationship between social support and incident hypertension in the Jackson Heart Study: A cohort study. *BMJ Open*. 2022;12(3):e054812.
35. Maki KG. The relationship between social support and Type 2 diabetes risk. *Commun Res Rep*. 2018;35(1):12–21.
36. Benca-Bachman CE, Najera DD, Whitfield KE, Taylor JL, Thorpe RJ, Palmer RHC. Quality and quantity of social support show differential associations with stress and depression in African Americans. *Am J Geriatr Psychiatry*. 2020;28(6):597–605.
37. Oremus M, Tyas SL, Newall NEG, Maxwell CJ, O’Connell ME, Zeng L. The association of pre-COVID-19 social isolation and functional social support with loneliness during COVID-19: a longitudinal analysis of the Canadian Longitudinal Study on Aging. *Aging Ment Health*. 2025;1–10.
38. Cohen S. Psychosocial models of the role of social support in the etiology of physical disease. *Health Psychol*. 1988;7(3):269–97.

39. Uchino BN, Cacioppo JT, Kiecolt-Glaser JK. The relationship between social support and physiological processes: A review with emphasis on underlying mechanisms and implications for health. *Psychol Bull.* 1996;119(3):488–531.
40. Cohen S, Mermelstein R, Kamarck T, Hoberman HM. Measuring the functional components of social support. In: Sarason IG, Sarason BR, editors. *Social support: Theory, research and applications.* Dordrecht: Springer Netherlands; 1985. p. 73–94.
41. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The Multidimensional Scale of Perceived Social Support. *J Pers Assess.* 1988;52(1):30–41.
42. Kuiper JS, Zuidersma M, Zuidema SU, Burgerhof JGM, Stolk RP, Oude Voshaar RC, et al. Social relationships and cognitive decline: A systematic review and meta-analysis of longitudinal cohort studies. *Int J Epidemiol.* 2016;45(4):1169–206.
43. Costa-Cordella S, Arevalo-Romero C, Parada FJ, Rossi A. Social support and cognition: A systematic review. *Front Psychol.* 2021;12:637060.
44. Kiely KM. Cognitive function. In: Michalos AC, editor. *Encyclopedia of quality of life and well-being research.* Dordrecht: Springer; 2014. p. 974–8.
45. Sachdev PS, Blacker D, Blazer DG, Ganguli M, Jeste D V., Paulsen JS, et al. Classifying neurocognitive disorders: The DSM-5 approach. *Nat Rev Neurol.* 2014;10(11):634–42.
46. Struble LM, Sullivan BJ. Cognitive health in older adults. *Nurse Pract.* 2011;36(4):24–34.
47. Umberson D, Montez JK. Social relationships and health: A flashpoint for health policy. *J Health Soc Behav.* 2010;51(Suppl):S54–66.
48. Aigbogun MS, Stellhorn R, Krasa H, Kostic D. Severity of memory impairment in the elderly: Association with health care resource use and functional limitations in the United States. *Alzheimers Dement.* 2017;8:51–9.
49. Public Health Agency of Canada. Dementia in Canada, including Alzheimer’s disease [Internet]. 2017. Available from: <https://www.canada.ca/en/public->

health/services/publications/diseases-conditions/dementia-highlights-canadian-chronic-disease-surveillance.html

50. Kelly ME, Duff H, Kelly S, McHugh Power JE, Brennan S, Lawlor BA, et al. The impact of social activities, social networks, social support and social relationships on the cognitive functioning of healthy older adults: A systematic review. *Syst Rev*. 2017;6(1):259.
51. Law CK, Lam FM, Chung RC, Pang MY. Physical exercise attenuates cognitive decline and reduces behavioural problems in people with mild cognitive impairment and dementia: a systematic review. *J Physiother*. 2020;66(1):9–18.
52. Hagger-Johnson G, Sabia S, Brunner EJ, Shipley M, Bobak M, Marmot M, et al. Combined impact of smoking and heavy alcohol use on cognitive decline in early old age: Whitehall II prospective cohort study. *Br J Psychiatry*. 2013;203(2):120–5.
53. Jacobsen LK, Krystal JH, Mencil WE, Westerveld M, Frost SJ, Pugh KR. Effects of smoking and smoking abstinence on cognition in adolescent tobacco smokers. *Biol Psychiatry*. 2005;57(1):56–66.
54. Glass JM, Buu A, Adams KM, Nigg JT, Puttler LI, Jester JM, et al. Effects of alcoholism severity and smoking on executive neurocognitive function. *Addiction*. 2009;104(1):38–48.
55. Schmand B, Smit J, Lindeboom J, Smits C, Hooijer C, Jonker C, et al. Low education is a genuine risk factor for accelerated memory decline and dementia. *J Clin Epidemiol*. 1997;50(9):1025–33.
56. Sörman DE, Rönnlund M, Sundström A, Norberg M, Nilsson LG. Social network size and cognitive functioning in middle-aged adults: Cross-sectional and longitudinal associations. *J Adult Dev*. 2017;24(2):77–88.
57. Donovan NJ, Wu Q, Rentz DM, Sperling RA, Marshall GA, Glymour MM. Loneliness, depression and cognitive function in older U.S. adults. *Int J Geriatr Psychiatry*. 2017;32(5):564–73.

58. Kizilbash A. The effects of depression and anxiety on memory performance. *Arch Clin Neuropsychol*. 2002;17(1):57–67.
59. Perry BL, McConnell WR, Peng S, Roth AR, Coleman M, Manchella M, et al. Social networks and cognitive function: An evaluation of social bridging and bonding mechanisms. *Gerontologist*. 2022;62(6):865–75.
60. Fratiglioni L, Wang HX, Ericsson K, Maytan M, Winblad B. Influence of social network on occurrence of dementia: A community-based longitudinal study. *Lancet*. 2000;355(9212):1315–9.
61. Håkansson K, Rovio S, Helkala EL, Vilska AR, Winblad B, Soininen H, et al. Association between mid-life marital status and cognitive function in later life: Population based cohort study. *BMJ*. 2009;339:b2462.
62. Sims RC, Hosey M, Levy SA, Whitfield KE, Katzel LI, Waldstein SR. Distinct functions of social support and cognitive function among older adults. *Exp Aging Res*. 2014;40(1):40–59.
63. Bedard M, Taler V. Social support buffers against cognitive decline in single mild traumatic brain injury with loss of consciousness: Results from the Canadian Longitudinal Study on Aging. *J Gerontol B Psychol Sci Soc Sci*. 2021;76(9):1777–87.
64. Folstein MF, Folstein SE, McHugh PR. “Mini-mental state”. A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res*. 1975;12(3):189–98.
65. Rey A. L’examen clinique en psychologie (The clinical psychological examination). Paris: Presses Universitaires de France; 1964.
66. Albert M, Smith LA, Scherr PA, Taylor JO, Evans DA, Funkenstein HH. Use of brief cognitive tests to identify individuals in the community with clinically diagnosed Alzheimer’s disease. *Int J Neurosci*. 1991;57(3–4):167–78.
67. Wechsler D. A standardized memory scale for clinical use. *J Psychol*. 1945;19(1):87–95.

68. Delis DC, Kramer JH, Kaplan E, Ober BA. California Verbal Learning Test: Adult version manual. San Antonio, TX: The Psychological Corporation; 1987.
69. Wollam ME, Weinstein AM, Saxton JA, Morrow L, Snitz B, Fowler NR, et al. Genetic risk score predicts late-life cognitive impairment. *J Aging Res.* 2015;2015:267062.
70. Small BJ, Fratiglioni L, Viitanen M, Winblad B, Bäckman L. The course of cognitive impairment in preclinical Alzheimer disease: Three- and 6-year follow-up of a population-based sample. *Arch Neurol.* 2000;57(6):839–44.
71. Mogic L, Rutter EC, Tyas SL, Maxwell CJ, O’Connell ME, Oremus M. Functional social support and cognitive function in middle- and older-aged adults: A systematic review of cross-sectional and cohort studies. *Syst Rev.* 2023;12(1):86.
72. Oremus M, Tyas SL, Maxwell CJ, Konnert C, O’Connell ME, Law J. Social support availability is positively associated with memory in persons aged 45-85 years: A cross-sectional analysis of the Canadian Longitudinal Study on Aging. *Arch Gerontol Geriatr.* 2020;86:103962.
73. Krueger KR, Wilson RS, Kamenetsky JM, Barnes LL, Bienias JL, Bennett DA. Social engagement and cognitive function in old age. *Exp Aging Res.* 2009;35(1):45–60.
74. Yoo SS, Tyas SL, Maxwell CJ, Oremus M. The association between functional social support and memory in middle-aged and older adults: A prospective analysis of the Canadian Longitudinal Study on Aging’s Comprehensive Cohort. *Arch Gerontol Geriatr.* 2023;114:105076.
75. Stinchcombe A, Hammond NG. Social determinants of memory change: A three-year follow-up of the Canadian Longitudinal Study on Aging (CLSA). *Arch Gerontol Geriatr.* 2023;104:104830.
76. Stern Y, Arenaza-Urquijo EM, Bartrés-Faz D, Belleville S, Cantilon M, Chetelat G, et al. Whitepaper: Defining and investigating cognitive reserve, brain reserve, and brain maintenance. *Alzheimers Dement.* 2020;16(9):1305–11.

77. Stern Y. Cognitive reserve in ageing and Alzheimer's disease. *Lancet Neurol.* 2012;11(11):1006–12.
78. Oosterhuis EJ, Slade K, May PJC, Nuttall HE. Toward an understanding of healthy cognitive aging: The importance of lifestyle in cognitive reserve and the scaffolding theory of aging and cognition. *J Gerontol B Psychol Sci Soc Sci.* 2023;78(5):777–88.
79. Evans IEM, Llewellyn DJ, Matthews FE, Woods RT, Brayne C, Clare L. Social isolation, cognitive reserve, and cognition in healthy older people. *PLoS One.* 2018;13(8):e0201008.
80. Perry BL, McConnell WR, Coleman ME, Roth AR, Peng S, Apostolova LG. Why the cognitive “fountain of youth” may be upstream: Pathways to dementia risk and resilience through social connectedness. *Alzheimers Dement.* 2022;18(5):934–41.
81. Endresz N. The association between social isolation, functional social support, and memory: A moderated mediation analysis of the Canadian Longitudinal Study on Aging [Internet]. [Waterloo, ON]: University of Waterloo; 2024. Available from: <http://hdl.handle.net/10012/20672>
82. Glymour MM, Weuve J, Fay ME, Glass T, Berkman LF. Social ties and cognitive recovery after stroke: Does social integration promote cognitive resilience? *Neuroepidemiology.* 2008;31(1):10–20.
83. Lewis MA, Rook KS. Social control in personal relationships: Impact on health behaviors and psychological distress. *Health Psychol.* 1999;18(1):63–71.
84. Tajfel H, Turner J. An integrative theory of intergroup conflict. In: Austin WG, Worchel S, editors. *The social psychology of intergroup relations.* Monterey, CA: Brooks/Cole; 1979. p. 33–47.
85. Datta BK, Coughlin SS, Ayadi J, Majeed B, Ansa BE. Relationship between social support, life satisfaction, and smoking status among US adults with cardiovascular risks. *Behav Med.* 2024;50(4):288–97.

86. Lee Westmaas J, Chantaprasopsuk S, Bontemps-Jones J, Stephens RL, Thorne C, Abroms LC. Longitudinal analysis of peer social support and quitting smoking: Moderation by sex and implications for cessation interventions. *Prev Med Rep.* 2022;30:102059.
87. Lindsay Smith G, Banting L, Eime R, O’Sullivan G, van Uffelen JGZ. The association between social support and physical activity in older adults: A systematic review. *Int J Behav Nutr Phys Act.* 2017;14(1):56.
88. Smith GSE, Moyle W, Burton NW. The relationship between social support for physical activity and physical activity across nine years in adults aged 60–65 years at baseline. *Int J Environ Res Public Health.* 2023;20(5):4531.
89. Zhang Y, Hasibagen, Zhang C. The influence of social support on the physical exercise behavior of college students: The mediating role of self-efficacy. *Front Psychol.* 2022;13.
90. Lechner W V, Laurene KR, Patel S, Anderson M, Grega C, Kenne DR. Changes in alcohol use as a function of psychological distress and social support following COVID-19 related university closings. *Addict Behav.* 2020;110:106527.
91. Blumberg M, Lo L, Harrison G, Dodwell A, Irwin S, Olmstead M. Differential impacts of perceived social support on alcohol and cannabis use in young adults: lessons from the COVID-19 pandemic. *Univ Toronto Med J.* 2023;100(1).
92. Hultsch DF, Hertzog C, Small BJ, Dixon RA. Use it or lose It: Engaged lifestyle as a buffer of cognitive decline in aging? *Psychol Aging.* 1999;14(2):245–63.
93. Hertzog C, Kramer AF, Wilson RS, Lindenberger U. Enrichment effects on adult cognitive development: Can the functional capacity of older adults be preserved and enhanced? *Psychol Sci Public Interest.* 2008;9(1):1–65.
94. Kleim JA, Jones TA. Principles of experience-dependent neural plasticity: Implications for rehabilitation after brain damage. *J Speech Lang Hear Res.* 2008;51(1).

95. Sharifian N, Zaheed AB, Morris EP, Sol K, Manly JJ, Schupf N, et al. Social network characteristics moderate associations between cortical thickness and cognitive functioning in older adults. *Alzheimers Dement*. 2022;18(2):339–47.
96. Bourassa KJ, Memel M, Woolverton C, Sbarra DA. Social participation predicts cognitive functioning in aging adults over time: Comparisons with physical health, depression, and physical activity. *Aging Ment Health*. 2017;21(2):133–46.
97. Statistics Canada. Estimates of population as of July 1st, by marital status or legal marital status, age and sex [Internet]. 2022. Available from: <https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1710006001>
98. Robles TF. Marital quality and health: Implications for marriage in the 21st century. *Curr Dir Psychol Sci*. 2014;23:427–32.
99. Grundström J, Konttinen H, Berg N, Kiviruusu O. Associations between relationship status and mental well-being in different life phases from young to middle adulthood. *SSM Popul Health*. 2021;14:100774.
100. Lima JC, Allen SM, Goldscheider F, Intrator O. Spousal caregiving in late midlife versus older ages: Implications of work and family obligations. *J Gerontol B Psychol Sci Soc Sci*. 2008;63(4):S229–38.
101. Walker RB, Luszcz MA. The health and relationship dynamics of late-life couples: A systematic review of the literature. *Ageing Soc*. 2009;29(3):455–80.
102. Park M, Wang S, Reynolds CF, Huang DL. Diversify your emotional assets: The association between the variety of sources of emotional support and thoughts of death or self-harm among US older adults. *Arch Suicide Res*. 2022;26(3):1410–22.
103. Barron CR, Foxall MJ, Von Dollen K, Jones PA, Shull KA. Marital status, social support, and loneliness in visually impaired elderly people. *J Adv Nurs*. 1994;19:272–80.
104. Wyke S, Ford G. Competing explanations for associations between marital status and health. *Soc Sci Med*. 1992;34(5):523–32.

105. Lindström M, Rosvall M. Marital status, social capital, economic stress, and mental health: A population-based study. *Soc Sci J*. 2012;49(3):339–42.
106. Liu H, Umberson DJ. The times they are a changin’: Marital status and health differentials from 1972 to 2003. *J Health Soc Behav*. 2008;49(3):239–53.
107. Spiker RL. Mental health and marital status. In: *The Wiley Blackwell Encyclopedia of Health, Illness, Behavior, and Society*. Chichester, UK: John Wiley & Sons Ltd; 2014. p. 1485–9.
108. Meek KP, Bergeron CD, Towne SD, Ahn SN, Ory MG, Smith ML. Restricted social engagement among adults living with chronic conditions. *Int J Environ Res Public Health*. 2018;15(1):158.
109. Holt-Lunstad J, Birmingham W, Jones BQ. Is there something unique about marriage? The relative impact of marital status, relationship quality, and network social support on ambulatory blood pressure and mental health. *Ann Behav Med*. 2008;35(2):239–44.
110. Markey CN, Markey PM, Schneider C, Brownlee S. Marital status and health beliefs: Different relations for men and women. *Sex Roles*. 2005;53(5–6):443–51.
111. Zheng X, Xue Y, Dong F, Shi L, Xiao S, Zhang J, et al. The association between health-promoting-lifestyles, and socioeconomic, family relationships, social support, health-related quality of life among older adults in China: A cross sectional study. *Health Qual Life Outcomes*. 2022;20(1).
112. Vaingankar JA, Abdin E, Chong SA, Shafie S, Sambasivam R, Zhang YJ, et al. The association of mental disorders with perceived social support, and the role of marital status: results from a national cross-sectional survey. *Arch Public Health*. 2020;78(1):108.
113. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. Updating guidance for reporting systematic reviews: development of the PRISMA 2020 statement. *J Clin Epidemiol*. 2021;134:103–12.

114. Covidence systematic review software [Internet]. Veritas Health Innovation. Melbourne, Australia: Veritas Health Innovation; 2024. Available from: www.covidence.org
115. Sonnegra A, Weir DR. The Health and Retirement Study: A public data resource for research on aging. *Open Health Data*. 2014;2(1):e7.
116. Steptoe A, Breeze E, Banks J, Nazroo J. Cohort profile: The English Longitudinal Study of Ageing. *Int J Epidemiol*. 2013;42(6):1640–8.
117. Anstey KJ, Christensen H, Butterworth P, Easteal S, Mackinnon A, Jacomb T, et al. Cohort profile: The PATH through life project. *Int J Epidemiol*. 2012;41(4):951–60.
118. Ofstedal MB, Fisher GG, Herzog AR. Documentation of cognitive functioning measures in the Health and Retirement Study [Internet]. Ann Arbor, MI; 2005. Available from: <https://hrs.isr.umich.edu/sites/default/files/biblio/dr-006.pdf>
119. Lee Y, Jiang Y. Examining sociocultural factors in widowhood and cognitive function among older Chinese immigrants: Findings from the PINE study. *Aging Ment Health*. 2023;27(11):2144–52.
120. Dong X, Wong E, Simon MA. Study design and implementation of the PINE study. *J Aging Health*. 2014;26(7):1085–99.
121. Simon MA, Chang ES, Rajan KB, Welch MJ, Dong X. Demographic characteristics of U.S. Chinese older adults in the Greater Chicago area. *J Aging Health*. 2014;26(7):1100–15.
122. Haghighi P, Zeng L, Tyas SL, Meyer SB, Oremus M. The association between functional social support, marital status and memory in middle-aged and older adults: An analysis of the Canadian Longitudinal Study on Aging. *Arch Gerontol Geriatr*. 2025;131:105770.
123. Raina P, Wolfson C, Kirkland S, Griffith LE, Balion C, Cossette B, et al. Cohort profile: The Canadian Longitudinal Study on Aging (CLSA). *Int J Epidemiol*. 2019;48(6):1752–1753j.

124. Statistics Canada. Canadian Community Health Survey - Healthy Aging (CCHS) [Internet]. 2010. Available from: <https://www23.statcan.gc.ca/imdb-bmdi/pub/5146-eng.htm>
125. Canadian Longitudinal Study on Aging. CLSA technical document: Sampling and computation of response rates and sample weights for the Tracking (telephone interview) participants and Comprehensive participants [Internet]. 2023 Feb. Available from: <https://www.clsa-elcv.ca/doc/5130>
126. Sachs BC, Latham LA, Bateman JR, Cleveland MJ, Espeland MA, Fischer E, et al. Feasibility of remote administration of the Uniform Data Set-Version 3 for assessment of older adults with mild cognitive impairment and Alzheimer's disease. *Arch Clin Neuropsychol*. 2024;39(5):635–43.
127. Robitaille A, Orpana H, McIntosh CN. Psychometric properties, factorial structure, and measurement invariance of the English and French versions of the Medical Outcomes Study Social Support Scale. *Health Rep*. 2011;22(2):33–40.
128. de Sousa Magalhães S, Malloy-Diniz LF, Hamdan AC. Validity convergent and reliability test-retest of the Rey Auditory Verbal Learning Test. *Clin Neuropsychiatry*. 2012;9:129–37.
129. Zuelsdorff ML, Engelman CD, Friedman EM, Kosciak RL, Jonaitis EM, Rue A La, et al. Stressful events, social support, and cognitive function in middle-aged adults with a family history of Alzheimer's disease. *J Aging Health*. 2013;25(6):944–59.
130. O'Connell ME, Tuokko H, Kadlec H, Griffith LE, Simard M, Taler V, et al. Normative comparison standards for measures of cognition in the Canadian Longitudinal Study on Aging (CLSA): Does applying sample weights make a difference? *Psychol Assess*. 2019;31(9):1081–91.
131. Han KT, Park EC, Kim JH, Kim SJ, Park S. Is marital status associated with quality of life? *Health Qual Life Outcomes*. 2014;12(1):109.

132. Canadian Longitudinal Study on Aging. Sampling and computation of response rates and sample weights for the Tracking (telephone interview) participants and Comprehensive participants. 2023 Feb.
133. Canadian Longitudinal Study on Aging. Data availability [Internet]. 2025. Available from: <https://www.clsa-elcv.ca/data-availability/>
134. Buuren S van, Groothuis-Oudshoorn K. mice: Multivariate imputation by chained equations in R. *J Stat Softw*. 2011;45(3):1–67.
135. Mistler SA, Enders CK. A comparison of joint model and Fully Conditional Specification imputation for multilevel missing data. *J Educ Behav Stat*. 2017;42(4):432–66.
136. Rubin DB. Multiple imputation for nonresponse in surveys. New York: John Wiley & Sons; 1987.
137. Cuzick J. Forest plots and the interpretation of subgroups. *Lancet*. 2005;365(9467):1308.
138. Yvonne Feilzer M. Doing mixed methods research pragmatically: Implications for the rediscovery of pragmatism as a research paradigm. *J Mix Methods Res*. 2010;4(1):6–16.
139. Creswell JW. Research design: Qualitative, quantitative, and mixed methods approaches. 3rd ed. Thousand Oaks, CA: Sage Publications; 2009.
140. K-W Seniors Day Program [Internet]. 2023. Available from: <https://www.k-wseniorsdayprogram.ca/>
141. Seniors Learning in Retirement (SLR) London [Internet]. 2025. Available from: <https://slrlondon.com/>
142. Donya's Pharmacy [Internet]. 2024. Available from: <https://www.donyaspharmacy.com/>
143. McMaster University. McMaster Institute for Research on Aging (MIRA) [Internet]. 2025. Available from: <https://mira.mcmaster.ca/>

144. Coffee News. Coffee News Canada [Internet]. 2025. Available from:
<https://www.coffeenewscanada.com/>
145. Saunders B, Sim J, Kingstone T, Baker S, Waterfield J, Bartlam B, et al. Saturation in qualitative research: Exploring its conceptualization and operationalization. *Qual Quant*. 2018;52(4):1893–907.
146. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77–101.
147. Braun V, Clarke V. Reflecting on reflexive thematic analysis. *Qual Res Sport Exerc Health*. 2019;11(4):589–97.
148. O'Connor C, Joffe H. Intercoder reliability in qualitative research: Debates and practical guidelines. *Int J Qual Methods*. 2020;19.
149. Braun V, Clarke V. Toward good practice in thematic analysis: Avoiding common problems and be(com)ing a knowing researcher. *Int J Transgend Health*. 2023;24(1):1–6.
150. Morse JM. “Perfectly healthy, but dead”: The myth of inter-rater reliability. *Qual Health Res*. 1997;7(4):445–7.
151. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349–57.
152. Creswell JW, Creswell JD. *Research design: Qualitative, quantitative, and mixed methods approaches*. 6th ed. Thousand Oaks, CA: Sage; 2022.
153. Lindert J, Paul KC, Lachman ME, Ritz B, Seeman TE. Depression-, anxiety-, and anger and cognitive functions: Findings from a longitudinal prospective study. *Front Psychiatry*. 2021;12:665742.
154. Nyberg L, Lövdén M, Riklund K, Lindenberger U, Bäckman L. Memory aging and brain maintenance. *Trends Cogn Sci*. 2012;16(5):292–305.

155. Luo L, Craik FI. Aging and memory: A cognitive approach. *Can J Psychiatry*. 2008;53(6):346–53.
156. Loprinzi PD, Frith E. The role of sex in memory function: Considerations and recommendations in the context of exercise. *J Clin Med*. 2018;7(6).
157. Nooyens ACJ, Wijnhoven HAH, Schaap LS, Sialino LD, Kok AAL, Visser M, et al. Sex differences in cognitive functioning with aging in the Netherlands. *Gerontology*. 2022;68(9):999–1009.
158. Zahodne LB, Mayeda ER, Hohman TJ, Fletcher E, Racine AM, Gavett B, et al. The role of education in a vascular pathway to episodic memory: Brain maintenance or cognitive reserve? *Neurobiol Aging*. 2019;84:109–18.
159. de Souza-Talarico JN, Caramelli P, Nitrini R, Chaves EC. The influence of schooling on working memory performance in elderly individuals without cognitive decline. *Dement Neuropsychol*. 2007;1(3):276–81.
160. Yin J, John A, Cadar D. Bidirectional associations of depressive symptoms and cognitive function over time. *JAMA Netw Open*. 2024;7(6):e2416305.
161. Kizilbash AH, Vanderploeg RD, Curtiss G. The effects of depression and anxiety on memory performance. *Arch Clin Neuropsychol*. 2002;17(1):57–67.
162. Dillon DG, Pizzagalli DA. Mechanisms of memory disruption in depression. *Trends Neurosci*. 2018;41(3):137–49.
163. Cornwell EY, Waite LJ. Measuring social isolation among older adults using multiple indicators from the NSHAP study. *J Gerontol B Psychol Sci Soc Sci*. 2009;64B(Supplement 1):i38–46.
164. Harris CB, Sutton J, Keil PG, McIlwain N, Harris SA, Barnier AJ, et al. Ageing together: Interdependence in the memory compensation strategies of long-married older couples. *Front Psychol*. 2022;13.
165. Dixon RA, de Frias CM, Bäckman L. Characteristics of self-reported memory compensation in older adults. *J Clin Exp Neuropsychol*. 2001;23(5):650–61.

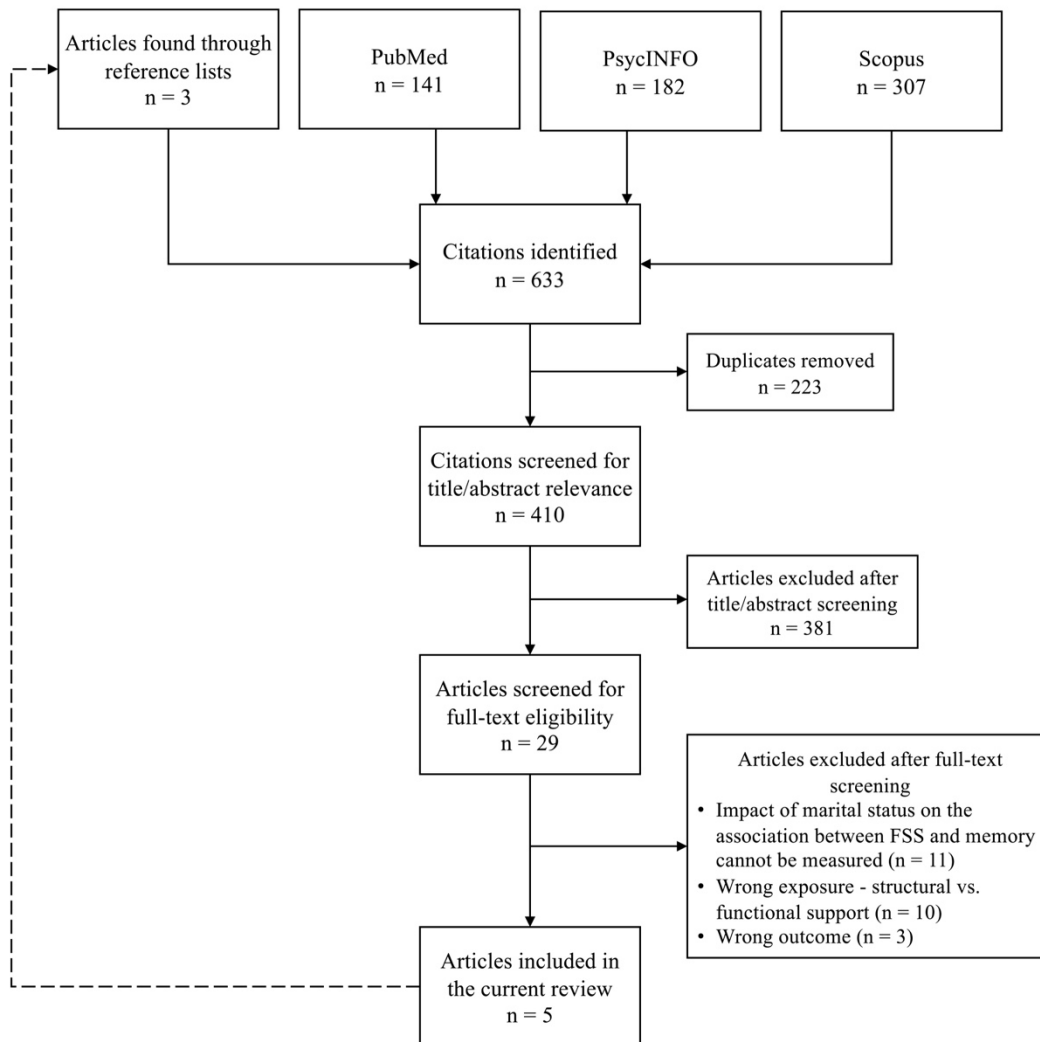
166. Tomaszewski Farias S, Schmitter-Edgecombe M, Weakley A, Harvey D, Denny KG, Barba C, et al. Compensation strategies in older adults: Association with cognition and everyday function. *Am J Alzheimers Dis Other Dement.* 2018;33(3):184–91.
167. Burack OR, Lachman ME. The effects of list-making on recall in young and elderly adults. *J Gerontol B Psychol Sci Soc Sci.* 1996;51B(4):P226–33.
168. Crabtree SA, Harris SM. The lived experience of ambiguous marital separation: A phenomenological study. *J Marital Fam Ther.* 2020;46(3):385–98.
169. Umberson D, Williams K, Powers DA, Liu H, Needham B. You make me sick: Marital quality and health over the life course. *J Health Soc Behav.* 2006;47(1):1–16.
170. Brock RL, Lawrence E. Too much of a good thing: Underprovision versus overprovision of partner support. *J Fam Psychol.* 2009;23(2):181–92.
171. Waldinger RJ, Cohen S, Schulz MS, Crowell JA. Security of attachment to spouses in late life. *Clin Psychol Sci.* 2015;3(4):516–29.
172. Lindert J, Paul KC, Lachman ME, Ritz B, Seeman T. Social stress and risk of declining cognition: A longitudinal study of men and women in the United States. *Soc Psychiatry Psychiatr Epidemiol.* 2022;57(9):1875–84.
173. Zahodne LB, Watson CWM, Seehra S, Martinez MN. Positive psychosocial factors and cognition in ethnically diverse older adults. *J Int Neuropsychol Soc.* 2018;24(3):294–304.
174. Bolger N, Amarel D. Effects of social support visibility on adjustment to stress: Experimental evidence. *J Pers Soc Psychol.* 2007;92(3):458–75.
175. Baltes MM, Wahl HW. Patterns of communication in old age: The dependence-support and independence-ignore script. *Health Commun.* 1996;8(3):217–31.
176. Baltes MM, Wahl HW. The dependency-support script in institutions: Generalization to community settings. *Psychol Aging.* 1992;7(3):409–18.
177. Kim Y. Gender differences in the link between marital quality and cognitive decline among older adults in Korea. *Psychiatry Investig.* 2021;18(11):1091–9.

178. Kim J, Kwon KY. Investigating heterogeneity in the relationship between marital satisfaction and cognitive health by gender and across the cognitive function distribution. *Innov Aging*. 2023;7(7).
179. Liu H, Zhang Z, Zhang Y. A national longitudinal study of marital quality and cognitive decline among older men and women. *Soc Sci Med*. 2021;282:114151.
180. Haghighi P, Littler EAL, Mauer-Vakil D, Miller M, Oremus M. Exploring the relationship between marital quality and cognitive function: A systematic review. *Soc Sci Med*. 2024;355:117120.
181. Lee CD, Park S, Foster ER. Subjective memory complaints and social participation among older adults: Results from the Health and Retirement Study. *Aging Ment Health*. 2022;26(9):1771–7.
182. Van Hout E, Contreras M, Mioshi E, Kishita N. Understanding the impact of dementia on spousal relationships: A qualitative study with female spousal carers of people living with dementia. *Dementia (London)*. 2025;24(1):23–39.
183. Vatter S, McDonald KR, Stanmore E, Clare L, McCormick SA, Leroi I. A qualitative study of female caregiving spouses' experiences of intimate relationships as cognition declines in Parkinson's disease. *Age Ageing*. 2018;47(4):604–10.
184. Wawrziczny E, Antoine P, Ducharme F, Kergoat MJ, Pasquier F. Couples' experiences with early-onset dementia: An interpretative phenomenological analysis of dyadic dynamics. *Dementia (London)*. 2016;15(5):1082–99.
185. Hammar LM, Williams CL, Meranius MS, McKee K. Being “alone” striving for belonging and adaption in a new reality - The experiences of spouse carers of persons with dementia. *Dementia (London)*. 2021;20(1):273–90.
186. Mrozowicz-Wrońska M, Janowicz K, Soroko E, Adamczyk K. Let's talk about single men: A qualitative investigation of never married men's experiences of singlehood. *Sex Roles*. 2023;89(7–8):360–76.

187. Sakraida TJ. Divorce transition differences of midlife women. *Issues Ment Health Nurs.* 2005;26(2):225–49.
188. Rimmer A. BMA meeting: Early dementia diagnosis is pointless without support services. *BMJ.* 2016;i3505.
189. World Health Organization. A toolkit on how to implement social prescribing. Manila, Philippines; 2022.
190. Polley M, Bertotti M, Kimberlee R, Pilkington K, Refsum C. A review of the evidence assessing impact of social prescribing on healthcare demand and cost implications. 2017 Jun.
191. Bickerdike L, Booth A, Wilson PM, Farley K, Wright K. Social prescribing: Less rhetoric and more reality. A systematic review of the evidence. *BMJ Open.* 2017;7(4):e013384.

Appendix A

PRISMA Flow Diagram of the Articles from the Systematic Review and Updated Literature Search



Appendix B

Summary of the Literature on the Association between FSS, Marital-related Variables, and Memory

Author, Year Country	Study Design	Sample Size; %female	Exposure(s) measured	Outcome(s) measured	Covariates	Summary of findings
Liao & Scholes, 2017 <i>England</i>	Longitudinal	10 241 53.3%	<i>Positive social support:</i> measured with three items asking how much members of one's social network understand the way they feel, can be relied on, and if they can open up to them.	<i>Memory:</i> measured with time orientation, verbal learning (immediate and delayed recall), and prospective memory tasks.	Age, sex, education, wealth, mobility limitations, depressive symptoms	Increased spousal support was associated with lower baseline memory in women. Increased spousal support was associated with slower memory decline in both sexes.
Scholes & Liao, 2022 <i>England</i>	Longitudinal	10 109 53%	<i>Social support:</i> measured with three items asking how much members of one's social network understand the way they feel, can be relied on, and if they can open up to them.	<i>Verbal memory:</i> measured using immediate and delayed word recall tasks.	Age, wealth, education, smoking status, alcohol consumption, physical activity, social participation, physical functioning, depressive symptoms	There were no significant associations between spousal support and baseline memory or memory change over time.
Windsor et al., 2014 <i>Australia</i>	Longitudinal	1618 49.3%	<i>Positive social exchanges:</i> measured with five items asking about emotional closeness and spouse dependability (e.g., "how much does your partner understand the way you feel about things?").	<i>Episodic memory:</i> measured using the California Verbal Learning Test. <i>Working memory:</i> measured using the digits backward subtest of the Wechsler Memory Scale.	Age, sex, education, physical functioning, depressive symptoms	There were no significant associations between positive spouse exchanges and episodic or working memory.

Zahodne et al., 2019 USA	Longitudinal	10 390 59.7%	<i>Marital status:</i> dichotomous (married/partnered vs. not married/partnered). <i>Social support:</i> measured with three items asking how much members of one's social network understand the way they feel, can be relied on, and if they can open up to them.	<i>Episodic memory:</i> measured with a variant of the CERAD list learning task that assesses immediate and delayed recall.	Age, gender, race/ethnicity, education, baseline assessment wave, depression, physical health/chronic health conditions, self-rated health	Being partnered and having less social support were both independently associated with better baseline memory. Being partnered was also associated with slower memory decline over time. There were no significant associations between spousal support and initial memory or memory decline.
<i>Updated literature search</i>						
Lee & Jiang, 2023 USA	Longitudinal	2515 57.8%	<i>Widowhood status:</i> categorized into three groups (married, recently widowed, and previously widowed). <i>Social support:</i> measured with 12 items asking about both positive and negative social interactions with family, friends, and a partner (e.g., "how often can you open up to them if you need to talk about your worries?").	<i>Episodic memory:</i> measured using the immediate and delayed recall components of the East Boston Memory Test.	Age, gender, education, number of living children, income, baseline memory function, depressive symptoms, chronic conditions	Neither widowhood status nor social support was associated with episodic memory. There were also no significant associations for the interaction between social support*recent widowhood or social support*previous widowhood and episodic memory.

Abbreviations: CERAD: Consortium to Establish a Registry for Alzheimer's Disease; USA: United States of America.

Appendix C

Functional Social Support Index: Medical Outcomes Study – Social Support Survey (MOS-SSS)

Item	Questions	Type of Functional Social Support
3	Someone you can count on to listen to you when you need to talk	Emotional/Informational
4	Someone to give you advice about a crisis	
8	Someone to give you information in order to help you understand a situation	
9	Someone to confide in or talk to about yourself or your problems	
13	Someone whose advice you really want	
16	Someone to share your most private worries and fears with	
17	Someone to turn to for suggestions about how to deal with a personal problem	
19	Someone who understands your problems	Tangible
2	Someone to help you if you were confined to bed	
5	Someone to take you to the doctor if you needed it	
12	Someone to prepare your meals if you were unable to	
15	Someone to help you with daily chores if you were sick	Affectionate
6	Someone who shows you love and affection	
10	Someone who hugs you	
20	Someone to love you and make you feel wanted	Positive social interaction
11	Someone to get together with for relaxation	
18	Someone to do something enjoyable with	
7	Someone to have a good time with	Additional item
14	Someone to do things with to help you get your mind off things	

Notes. This table was adapted from the original MOS-SSS (26), which contains a total of 20 items. Item 1 “About how many close friends and close relatives do you have (people you feel at ease with and can talk to about what is on your mind)?” was excluded from this study because it assesses structural social support. Item 14 was not grouped into any subtypes but was included in the score for overall FSS.

Appendix D

List of Words Used in the Rey Auditory Verbal Learning Test (RAVLT)

ENGLISH	FRENCH
Drum	Tambour
Curtain	Rideau
Bell	Cloche
Coffee	Café
School	École
Parent	Parent
Moon	Lune
Garden	Jardin
Hat	Chapeau
Farmer	Fermier
Nose	Nez
Turkey	Dinde
Color	Couleur
House	Maison
River	Rivière

Appendix E

Description of Covariates

	Covariate	Measurement	Scale
Sociodemographic	Sex	Male Female	
	Age group	45-54 years 55-64 years 65-74 years 75 years or older	
	Education	Less than high school High school diploma Some post-secondary education Post-secondary degree/diploma	
	Province of residence	One of the ten provinces	
	Total annual household income	Less than \$20,000 From \$20,000 to under \$50,000 From \$50,000 to under \$100,000 From \$100,000 to under \$150,000 \$150,000 or more	
	Living arrangement	0 (living alone) 1 (living with someone)	
Health	Chronic conditions	0 (no chronic condition) 1 (one or more chronic conditions)	
	Functional status (ADL and IADL)	0 (no functional impairment) 1 (mild impairment) 2 (moderate impairment) 3 (severe or total impairment)	Modified OARS
	Depressive symptoms	0 (score of < 10) 1 (score of ≥ 10)	CES-D10
Lifestyle	Smoking status	0 (never smoker) 1 (occasional smoker) 2 (daily smoker)	
	Alcohol consumption	0 (never drinker) 1 (drinks less than once per month) 2 (drinks 1-3 times per month) 3 (drinks 1 or more times a week)	

Abbreviations: ADL: Activities of Daily Living; IADL: Instrumental Activities of Daily Living; OARS: Older Americans' Resources and Services – Multidimensional Assessment Questionnaire; CES-D10: Center for Epidemiologic Studies Depression Scale.

Appendix F

Participant Information Letter

Project Title: Exploring the link between functional social support, marital status and memory from the perspective of community-dwelling middle-aged and older adults: A qualitative study

Principal Investigator (or Faculty Supervisor): Dr. Mark Oremus, School of Public Health Sciences, moremus@uwaterloo.ca

Student Investigator: Paniz Haghighi, School of Public Health Sciences, p4haghighi@uwaterloo.ca

This letter explains what the study is about, what you will do if you participate, and what your rights are as a research participant. You may keep a copy of this letter for your records. If you do not understand something in the letter, please ask one of the investigators before you agree to participate.

Sometimes, as we get older, we have trouble remembering important things like dates or locations. These memory problems can be a sign of a bigger problem, such as Alzheimer's disease. Therefore, researchers are trying to explore factors that can help reduce these memory problems. One factor that might help is having people around who can provide practical help and emotional support when you need it, like family, friends or other loved ones. This is called "functional social support" or FSS. We know that people who have more FSS typically have better memory, but we do not know if being married affects this relationship, as well. Therefore, we are doing this study to get your thoughts about whether and how your marital status affects FSS and memory.

This study is the second component of a larger study. The first part of this study involved a survey of Canadians who are aged 45-85 and have different types of marital status. We want to talk to a similar sample of people to find out more about how social relationships affect memory and gain a deeper understanding of how these variables are connected. We value your input and would appreciate hearing from you on this important topic.

Participation in this study is voluntary. If you do decide to participate, we will first ask you some basic demographic questions (e.g., age, sex, marital status, and highest education level) to get to know you better. Regardless of your responses to these demographic questions, you will be eligible to participate in the study as long as you fit the age requirements as outlined above (i.e., between 45 and 85 years old). We will then interview you over a videochat only once. The interview will take no more than 60 minutes and will be conducted over an online platform, Zoom. Please note that Zoom has implemented technical, administrative, and physical safeguards to protect the information provided via the Services from loss, misuse, and unauthorized access, disclosure, alteration, or destruction. However, no Internet transmission is ever fully secure or error free. It is also important to note that only the audio recording from our interview will be kept for research purposes. The video portion will be deleted immediately after our meeting and the audio file will be deleted once our interview has been transcribed. Participating in this study will not result in any immediate benefits for you. However, your input will give us a better understanding of how marital relationships and social support can affect the memory of Canadians.

You may decline to answer any of the questions at any time throughout the interview process. You can also withdraw from this study at any time without any negative consequences by telling the researcher. If you wish to withdraw your study data after participating, you may let us know up to 3 months after your interview is conducted. After that, you may not withdraw your data because we may have already used it in published papers and reports. Rest assured, your name or any other identifying information will not be used in any paper or report on this study.

As a condition of participating in this study, you must allow the interview to be audio-recorded and transcribed for further analysis. Shortly after the interview has been completed, I will send you a copy of the transcript to allow you to confirm the accuracy of our conversation and to add or clarify any points that you wish. Please be assured that all interview transcripts and audio recordings collected during this study will be stored in a secure folder on a University of Waterloo server and only researchers associated with this project will have access to these files. All study documents will be retained for at least 7 years, after which they will be disposed of in accordance with university policies.

Your identity will be kept confidential. However, with your permission, anonymous quotations may be used. There are no known or anticipated risks associated with participating in this study.

This study has been reviewed and received ethics clearance through the University of Waterloo's Office of Research Ethics (REB #45801). If you have questions for the Board, contact the Office of Research Ethics, toll-free at 1-833-643-2379 (Canada and USA), 1-519-888-4440, or reb@uwaterloo.ca.

For all other questions, or if you would like additional information to assist you in reaching a decision about participation, please contact me at 226-254-0888 or by email at p4haghig@uwaterloo. You can also contact my supervisor, Professor Mark Oremus at 519-888-4567 ext. 45129 or email moremus@uwaterloo.ca.

I very much look forward to speaking with you and thank you in advance for your assistance in this project.

Yours Sincerely,

Paniz Haghighi

Appendix G

Participant Consent Form

Study Title: Exploring the link between functional social support, marital status and memory from the perspective of community-dwelling middle-aged and older adults: A qualitative study

By providing your consent, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

I have read the information presented in the information letter about the study being conducted by Dr. Mark Oremus and Mrs. Paniz Haghighi from the School of Public Health Sciences at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions and address any potential concerns.

I am aware that my interview will be audio recorded and transcribed verbatim to ensure an accurate recording of my responses. I understand that any video recordings will be deleted immediately after our meeting and the audio file will be deleted once the interview is transcribed.

I am also aware that sections from the interview may be quoted in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous.

I was informed that I may withdraw my consent at any time without penalty by advising the researcher. Data cannot be withdrawn after results have been published.

This study has been reviewed and received ethics clearance through the University of Waterloo's Office of Research Ethics (ORE #45801). If you have questions for the Board, contact the Office of Research Ethics, toll-free at 1-833-643-2379 (Canada and USA), 1-519-888-4440, or reb@uwaterloo.ca.

For all other questions, please contact Paniz Haghighi at 226-799-5414 or by email at: p4haghig@uwaterloo.ca

☐ YES ☐ NO I agree, of my own free will, to participate in this study.

☐ YES ☐ NO I agree to have my interview audio recorded.

☐ YES ☐ NO I agree to the use of anonymous quotations in any paper or publication that comes from this research.

☐ YES ☐ NO I would like to review and approve my quotations before they are used as study results.

Participant Name: _____ (Please print)

Participant Signature: _____

Date: _____

Appendix H

Semi-Structured Interview Guide

Participant ID: ____

Date (MM-DD-YYYY): _____

Introduction:

Thank you very much for meeting with me. In our interview today, I would like to ask you some questions about your social relationships and the influence they may have on your memory. Your participation in this study is voluntary. If you would like to stop at any point during the interview, then please let me know.

Before we start, I would just like to inform you that to participate in this interview today, you must agree to have our conversation audio-recorded. This audio recording will only be used to transcribe the interview for subsequent analysis and will not be shared with anyone except myself and authorized members of the research team. All personal information, including your name and contact information, will not be included in the written transcript. In addition, your identity will be kept confidential. If you wish to look over your interview transcript, you may let me know at the end of the interview and I will send you a copy.

Demographic Information:

I am first going to start by asking you a few basic demographic questions to get to know you better. Can you please tell me your:

Age:

Sex:

Highest level of education:

Marital status:

Participant's Perceived Level of Social Support:

- 1) Can you describe the current support systems that are available to you? Who can you call upon to provide you with social support, especially in times of need?
⇒ *Prompts:* family, friends, spouses, relatives, etc.
- 2) What types of support do they provide? For example, do they drive you to appointments or provide you with advice or a shoulder to lean on?
- 3) Do you feel this support system is helpful to you? In what ways?
- 4) How do you think the social support available to you influences your physical and/or mental well-being?

Marital Status and Satisfaction:

- 5) You said your marital status was ____, how long have you been in your current marital status?
- ⇒ *If married or in a common-law relationship:* How satisfied are you with your current relationship on a scale of 1 to 10, with 10 being very satisfied (i.e., do you feel that your spouse/partner understands you, you can rely on them if you have a serious problem or be yourself around them)? Can you comment on your rating?
 - ⇒ *If single, divorced, or separated:* How satisfied are you with being ____ on a scale of 1 to 10, with 10 being very satisfied? Can you comment on your rating?
 - ⇒ *If widowed:* How satisfied were you with your previous relationship on a scale of 1 to 10, with 10 being very satisfied (i.e., did you feel that your spouse/partner understood you, you could rely on them if you had a serious problem or be yourself around them)? Can you comment on your rating?

Memory Function:

- 6) How would you rate your memory on a day-to-day basis on a scale of 1 to 10, with 10 being excellent (i.e., no or minimal memory problems)?
- ⇒ Can you tell me more about why you picked that number? What does that mean to you?
- 7) How do you typically cope with memory challenges or lapses? Are there any helpful tools or things you do to help jog your memory?

FSS and Memory:

- 8) Earlier you mentioned that you receive support in the form of _____. Do you feel like having this type of support can help people to remember things better?
- ⇒ Can you share any specific examples of how support from loved ones might be able to influence memory in certain situations? (e.g., emotional support, tangible support, informational support, etc.)

Marital Status, FSS and Memory:

- 9) Earlier, you mentioned that you were ____ [*insert marital status*]. Does the fact that you are ____ influence your memory?
- ⇒ *If yes:* how might it influence your memory?
 - ⇒ *If no:* why do you think that might be?
- 10) Earlier I asked if you think that support from loved ones has an impact on memory. Building on this, do you think marital status may play a role in how social support affects memory and can you expand on your reasoning?
- 11) In what ways do you think the influence of social support on memory might differ for people who are married, single, divorced, separated or widowed?

Optional – based on responses to previous questions:

- 12) As mentioned previously, this study is the second component of a larger project examining the role of social and marital relationships on memory. In the first component of this study, we found that social support does not influence memory differently for people who are married, compared to those who are unmarried (i.e., single, divorced, widowed, or separated). Can you comment on these findings?
- ⇒ Why do you think we may have found this?

Closing Statements:

Thank you so much for taking part in this interview today.

- 13) Is there anything else you would like to add to what we discussed today?
- ⇒ Are there any additional factors about the research that we have not discussed, but which you would like to bring up?

Appendix I

Tables for All Base Regression Models Stratified by Baseline Marital Status

Table I1. Base Regression Models for the Association Between FSS and Memory – Married or Common-Law at Baseline

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.11 (0.05, 0.17)	0.05 (-0.00, 0.11)	0.07 (0.01, 0.12)	0.09 (0.04, 0.14)	0.12 (0.06, 0.18)
Time (vs. baseline)					
Follow-up 1	-0.05 (-0.39, 0.28)	-0.09 (-0.39, 0.21)	-0.13 (-0.44, 0.17)	0.00 (-0.28, 0.29)	0.08 (-0.27, 0.44)
Follow-up 2	-0.24 (-0.59, 0.10)	-0.19 (-0.50, 0.12)	-0.22 (-0.53, 0.08)	-0.17 (-0.47, 0.12)	-0.08 (-0.45, 0.28)
Sex (vs. male)					
Female	1.02 (0.96, 1.08)	1.03 (0.97, 1.09)	1.02 (0.96, 1.08)	1.01 (0.95, 1.07)	1.02 (0.96, 1.08)
Age (vs. 45-54 years)					
55-64 years	-0.11 (-0.17, -0.05)	-0.11 (-0.17, -0.05)	-0.11 (-0.17, -0.05)	-0.11 (-0.17, -0.05)	-0.11 (-0.17, -0.05)
65-74 years	-0.46 (-0.53, -0.38)	-0.46 (-0.53, -0.38)	-0.46 (-0.53, -0.38)	-0.45 (-0.53, -0.38)	-0.45 (-0.53, -0.38)
≥ 75 years	-1.09 (-1.19, -1.00)	-1.10 (-1.19, -1.00)	-1.10 (-1.19, -1.00)	-1.09 (-1.19, -1.00)	-1.09 (-1.19, -1.00)
Province (vs. Ontario)					
Alberta	0.04 (-0.07, 0.14)	0.03 (-0.08, 0.14)	0.03 (-0.08, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.08, 0.14)
British Columbia	0.12 (0.02, 0.23)	0.12 (0.02, 0.22)	0.12 (0.02, 0.23)	0.12 (0.02, 0.23)	0.12 (0.02, 0.22)
Manitoba	-0.07 (-0.20, 0.06)	-0.07 (-0.20, 0.06)	-0.07 (-0.20, 0.06)	-0.07 (-0.20, 0.06)	-0.07 (-0.20, 0.06)
New Brunswick	-0.23 (-0.36, -0.09)	-0.23 (-0.36, -0.09)	-0.23 (-0.36, -0.09)	-0.23 (-0.36, -0.09)	-0.23 (-0.36, -0.10)
Newfoundland & Labrador	-0.14 (-0.28, -0.00)	-0.14 (-0.28, -0.00)	-0.14 (-0.28, -0.00)	-0.14 (-0.28, -0.00)	-0.14 (-0.28, -0.00)
Nova Scotia	-0.07 (-0.18, 0.05)	-0.06 (-0.18, 0.05)	-0.06 (-0.18, 0.06)	-0.07 (-0.18, 0.05)	-0.07 (-0.19, 0.05)
Prince Edward Island	-0.09 (-0.23, 0.05)	-0.09 (-0.23, 0.06)	-0.08 (-0.23, 0.06)	-0.09 (-0.23, 0.05)	-0.09 (-0.23, 0.05)
Quebec	-0.14 (-0.24, -0.05)	-0.15 (-0.24, -0.05)	-0.15 (-0.25, -0.05)	-0.13 (-0.23, -0.04)	-0.14 (-0.24, -0.05)
Saskatchewan	-0.04 (-0.18, 0.10)	-0.04 (-0.18, 0.09)	-0.04 (-0.18, 0.10)	-0.04 (-0.18, 0.10)	-0.05 (-0.18, 0.09)
FSS*Time (vs. baseline)					
Follow-up 1	0.02 (-0.05, 0.10)	0.03 (-0.03, 0.10)	0.04 (-0.02, 0.11)	0.01 (-0.05, 0.08)	-0.00 (-0.08, 0.07)
Follow-up 2	0.08 (0.00, 0.15)	0.07 (-0.00, 0.13)	0.07 (0.01, 0.14)	0.06 (-0.00, 0.13)	0.04 (-0.04, 0.12)

Source: From *Haghighi et al. (2025) Supplementary Appendix: All Base and Fully Adjusted Regression Models Stratified by Baseline Marital Status*, by Haghighi, P., 2024, figshare. <https://doi.org/10.6084/m9.figshare.27190908>. This is an online resource under the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Table I2. Base Regression Models for the Association Between FSS and Memory – WDS at Baseline

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.20 (0.10, 0.30)	0.11 (0.03, 0.19)	0.18 (0.09, 0.26)	0.15 (0.06, 0.24)	0.15 (0.07, 0.22)
Time (vs. baseline)					
Follow-up 1	0.06 (-0.41, 0.53)	-0.09 (-0.47, 0.29)	0.09 (-0.34, 0.51)	0.03 (-0.42, 0.47)	-0.04 (-0.44, 0.37)
Follow-up 2	0.47 (-0.02, 0.97)	0.35 (-0.06, 0.76)	0.37 (-0.07, 0.82)	0.29 (-0.18, 0.76)	0.37 (-0.05, 0.80)
Sex (vs. male)					
Female	0.95 (0.80, 1.09)	0.97 (0.82, 1.11)	0.96 (0.81, 1.10)	0.95 (0.81, 1.10)	0.96 (0.81, 1.10)
Age (vs. 45-54 years)					
55-64 years	-0.03 (-0.19, 0.13)	-0.03 (-0.19, 0.13)	-0.04 (-0.20, 0.12)	-0.03 (-0.19, 0.14)	-0.02 (-0.18, 0.14)
65-74 years	-0.20 (-0.39, -0.02)	-0.20 (-0.38, -0.02)	-0.21 (-0.40, -0.03)	-0.19 (-0.37, -0.01)	-0.20 (-0.38, -0.01)
≥ 75 years	-0.94 (-1.14, -0.74)	-0.94 (-1.14, -0.74)	-0.95 (-1.15, -0.75)	-0.93 (-1.13, -0.72)	-0.94 (-1.14, -0.74)
Province (vs. Ontario)					
Alberta	0.06 (-0.19, 0.31)	0.05 (-0.20, 0.30)	0.05 (-0.20, 0.30)	0.05 (-0.19, 0.30)	0.05 (-0.19, 0.30)
British Columbia	-0.02 (-0.26, 0.21)	-0.03 (-0.26, 0.21)	-0.03 (-0.26, 0.21)	-0.02 (-0.25, 0.22)	-0.03 (-0.26, 0.21)
Manitoba	-0.00 (-0.27, 0.27)	-0.00 (-0.27, 0.27)	-0.00 (-0.27, 0.27)	-0.00 (-0.27, 0.27)	0.00 (-0.27, 0.27)
New Brunswick	0.10 (-0.17, 0.38)	0.09 (-0.18, 0.36)	0.10 (-0.18, 0.37)	0.11 (-0.16, 0.38)	0.10 (-0.17, 0.38)
Newfoundland & Labrador	0.11 (-0.23, 0.45)	0.12 (-0.22, 0.46)	0.12 (-0.22, 0.46)	0.12 (-0.21, 0.46)	0.12 (-0.22, 0.45)
Nova Scotia	-0.00 (-0.29, 0.28)	-0.02 (-0.30, 0.27)	-0.00 (-0.28, 0.28)	-0.00 (-0.28, 0.28)	-0.00 (-0.28, 0.28)
Prince Edward Island	0.06 (-0.24, 0.37)	0.06 (-0.25, 0.37)	0.07 (-0.24, 0.38)	0.06 (-0.25, 0.37)	0.07 (-0.24, 0.38)
Quebec	0.04 (-0.15, 0.24)	0.03 (-0.17, 0.22)	0.04 (-0.16, 0.23)	0.05 (-0.14, 0.25)	0.05 (-0.15, 0.24)
Saskatchewan	-0.03 (-0.32, 0.27)	-0.03 (-0.33, 0.27)	-0.03 (-0.33, 0.27)	-0.02 (-0.32, 0.27)	-0.03 (-0.33, 0.27)
FSS*Time (vs. baseline)					
Follow-up 1	-0.04 (-0.15, 0.07)	-0.00 (-0.10, 0.09)	-0.05 (-0.15, 0.06)	-0.03 (-0.14, 0.07)	-0.02 (-0.11, 0.08)
Follow-up 2	-0.14 (-0.26, -0.02)	-0.12 (-0.22, -0.02)	-0.12 (-0.22, -0.01)	-0.10 (-0.21, 0.02)	-0.12 (-0.22, -0.02)

Source: From Haghighi et al. (2025) *Supplementary Appendix: All Base and Fully Adjusted Regression Models Stratified by Baseline Marital Status*, by Haghighi, P., 2024, figshare. <https://doi.org/10.6084/m9.figshare.27190908>. This is an online resource under the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Table I3. Base Regression Models for the Association Between FSS and Memory – Single at Baseline

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.05 (-0.08, 0.18)	0.03 (-0.07, 0.13)	0.05 (-0.07, 0.17)	0.03 (-0.09, 0.15)	0.06 (-0.04, 0.16)
Time (vs. baseline)					
Follow-up 1	-0.05 (-0.63, 0.54)	-0.01 (-0.46, 0.44)	-0.07 (-0.64, 0.50)	-0.05 (-0.63, 0.53)	0.08 (-0.40, 0.56)
Follow-up 2	0.10 (-0.51, 0.72)	0.26 (-0.22, 0.75)	0.18 (-0.41, 0.77)	-0.12 (-0.74, 0.49)	0.23 (-0.27, 0.74)
Sex (vs. male)					
Female	1.02 (0.80, 1.24)	1.03 (0.82, 1.25)	1.02 (0.81, 1.24)	1.02 (0.80, 1.24)	1.02 (0.81, 1.24)
Age (vs. 45-54 years)					
55-64 years	-0.07 (-0.25, 0.12)	-0.07 (-0.25, 0.11)	-0.07 (-0.25, 0.11)	-0.07 (-0.25, 0.12)	-0.06 (-0.25, 0.12)
65-74 years	-0.29 (-0.54, -0.04)	-0.29 (-0.54, -0.04)	-0.29 (-0.54, -0.04)	-0.29 (-0.54, -0.04)	-0.29 (-0.54, -0.04)
≥ 75 years	-0.83 (-1.17, -0.49)	-0.83 (-1.17, -0.49)	-0.83 (-1.17, -0.49)	-0.83 (-1.17, -0.49)	-0.82 (-1.16, -0.48)
Province (vs. Ontario)					
Alberta	-0.12 (-0.57, 0.34)	-0.12 (-0.58, 0.33)	-0.12 (-0.57, 0.34)	-0.12 (-0.58, 0.33)	-0.12 (-0.57, 0.34)
British Columbia	-0.07 (-0.47, 0.32)	-0.08 (-0.48, 0.32)	-0.08 (-0.47, 0.32)	-0.08 (-0.48, 0.32)	-0.08 (-0.47, 0.32)
Manitoba	0.27 (-0.24, 0.79)	0.26 (-0.26, 0.78)	0.26 (-0.25, 0.78)	0.27 (-0.25, 0.79)	0.27 (-0.24, 0.79)
New Brunswick	-0.30 (-0.79, 0.18)	-0.31 (-0.79, 0.18)	-0.30 (-0.79, 0.18)	-0.29 (-0.78, 0.19)	-0.30 (-0.79, 0.18)
Newfoundland & Labrador	-0.19 (-0.70, 0.33)	-0.19 (-0.70, 0.32)	-0.18 (-0.70, 0.33)	-0.19 (-0.70, 0.33)	-0.18 (-0.69, 0.33)
Nova Scotia	-0.03 (-0.51, 0.46)	-0.04 (-0.52, 0.45)	-0.03 (-0.51, 0.46)	-0.02 (-0.51, 0.46)	-0.03 (-0.51, 0.46)
Prince Edward Island	-0.24 (-0.83, 0.34)	-0.26 (-0.84, 0.33)	-0.24 (-0.83, 0.35)	-0.24 (-0.83, 0.35)	-0.25 (-0.83, 0.34)
Quebec	-0.08 (-0.38, 0.21)	-0.09 (-0.39, 0.20)	-0.09 (-0.38, 0.20)	-0.08 (-0.37, 0.21)	-0.08 (-0.37, 0.21)
Saskatchewan	-0.47 (-0.99, 0.04)	-0.47 (-0.98, 0.05)	-0.47 (-0.98, 0.05)	-0.47 (-0.99, 0.04)	-0.47 (-0.99, 0.05)
FSS*Time (vs. baseline)					
Follow-up 1	0.03 (-0.12, 0.17)	0.02 (-0.10, 0.13)	0.03 (-0.11, 0.17)	0.03 (-0.12, 0.17)	-0.01 (-0.13, 0.11)
Follow-up 2	0.00 (-0.15, 0.16)	-0.04 (-0.16, 0.08)	-0.02 (-0.16, 0.13)	0.06 (-0.09, 0.21)	-0.03 (-0.16, 0.09)

Source: From Haghighi et al. (2025) *Supplementary Appendix: All Base and Fully Adjusted Regression Models Stratified by Baseline Marital Status*, by Haghighi, P., 2024, figshare. <https://doi.org/10.6084/m9.figshare.27190908>. This is an online resource under the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Appendix J

Tables for All Fully Adjusted Regression Models Stratified by Baseline Marital Status

Table J1. Fully Adjusted Regression Models for the Association Between FSS and Memory – Married or Common-Law at Baseline

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.09 (0.02, 0.17)	0.07 (0.01, 0.14)	0.07 (0.01, 0.14)	0.06 (-0.00, 0.12)	0.10 (0.02, 0.18)
Time (vs. baseline)					
Follow-up 1	0.05 (-0.35, 0.45)	0.12 (-0.24, 0.48)	0.05 (-0.31, 0.41)	-0.04 (-0.37, 0.29)	0.21 (-0.22, 0.64)
Follow-up 2	-0.15 (-0.58, 0.28)	-0.06 (-0.45, 0.33)	-0.06 (-0.44, 0.32)	-0.16 (-0.51, 0.19)	-0.02 (-0.48, 0.44)
Sex (vs. male)					
Female	1.10 (1.03, 1.16)	1.11 (1.04, 1.17)	1.10 (1.04, 1.16)	1.10 (1.04, 1.16)	1.10 (1.03, 1.16)
Age (vs. 45-54 years)					
55-64 years	-0.08 (-0.15, -0.01)	-0.08 (-0.15, -0.01)	-0.08 (-0.15, -0.01)	-0.07 (-0.14, 0.00)	-0.07 (-0.15, -0.00)
65-74 years	-0.38 (-0.47, -0.29)	-0.38 (-0.47, -0.30)	-0.38 (-0.47, -0.29)	-0.37 (-0.46, -0.28)	-0.38 (-0.46, -0.29)
≥ 75 years	-0.95 (-1.06, -0.84)	-0.96 (-1.06, -0.85)	-0.95 (-1.06, -0.84)	-0.94 (-1.05, -0.84)	-0.95 (-1.06, -0.84)
Province (vs. Ontario)					
Alberta	0.01 (-0.11, 0.12)	0.01 (-0.11, 0.12)	0.01 (-0.11, 0.12)	0.01 (-0.11, 0.12)	0.00 (-0.11, 0.12)
British Columbia	0.09 (-0.01, 0.20)	0.09 (-0.01, 0.20)	0.09 (-0.01, 0.20)	0.09 (-0.02, 0.20)	0.09 (-0.02, 0.20)
Manitoba	-0.06 (-0.20, 0.09)	-0.06 (-0.20, 0.09)	-0.06 (-0.20, 0.09)	-0.06 (-0.20, 0.08)	-0.06 (-0.20, 0.09)
New Brunswick	-0.15 (-0.29, -0.01)	-0.15 (-0.29, -0.01)	-0.15 (-0.29, -0.00)	-0.15 (-0.29, -0.00)	-0.15 (-0.29, -0.01)
Newfoundland & Labrador	-0.09 (-0.23, 0.05)	-0.09 (-0.24, 0.05)	-0.10 (-0.24, 0.05)	-0.09 (-0.24, 0.06)	-0.09 (-0.24, 0.05)
Nova Scotia	-0.02 (-0.15, 0.11)	-0.02 (-0.15, 0.11)	-0.02 (-0.15, 0.11)	-0.02 (-0.15, 0.11)	-0.02 (-0.15, 0.11)
Prince Edward Island	-0.06 (-0.21, 0.09)	-0.06 (-0.21, 0.09)	-0.06 (-0.21, 0.09)	-0.06 (-0.20, 0.09)	-0.06 (-0.21, 0.09)
Quebec	-0.11 (-0.21, -0.01)	-0.12 (-0.22, -0.01)	-0.12 (-0.22, -0.02)	-0.10 (-0.20, -0.00)	-0.11 (-0.21, -0.01)
Saskatchewan	-0.07 (-0.21, 0.09)	-0.07 (-0.21, 0.08)	-0.07 (-0.21, 0.08)	-0.06 (-0.21, 0.08)	-0.07 (-0.22, 0.07)
Education (vs. less than high school)					
High school diploma	0.26 (0.10, 0.43)	0.27 (0.10, 0.43)	0.27 (0.10, 0.43)	0.26 (0.09, 0.43)	0.26 (0.10, 0.43)
Some post-secondary education	0.44 (0.26, 0.63)	0.44 (0.26, 0.63)	0.45 (0.26, 0.63)	0.44 (0.26, 0.63)	0.44 (0.26, 0.63)
Post-secondary diploma/degree	0.59 (0.45, 0.74)	0.59 (0.45, 0.74)	0.60 (0.45, 0.74)	0.59 (0.44, 0.74)	0.60 (0.45, 0.74)

Annual household income (vs. ≤ \$19,999)					
\$ 20,000 – 49,999	0.20 (-0.02, 0.43)	0.21 (-0.02, 0.43)	0.20 (-0.03, 0.42)	0.20 (-0.02, 0.43)	0.20 (-0.02, 0.43)
\$ 50,000 – 99,999	0.31 (0.08, 0.53)	0.31 (0.09, 0.54)	0.30 (0.08, 0.53)	0.31 (0.09, 0.54)	0.31 (0.09, 0.54)
\$ 100,000 – 149,999	0.49 (0.26, 0.72)	0.50 (0.27, 0.73)	0.49 (0.26, 0.72)	0.50 (0.27, 0.73)	0.50 (0.27, 0.73)
≥ \$ 150,000	0.57 (0.33, 0.81)	0.58 (0.34, 0.82)	0.57 (0.33, 0.81)	0.58 (0.34, 0.82)	0.58 (0.34, 0.81)
Living arrangement (vs. living alone)					
Living with others	-0.07 (-0.19, 0.05)	-0.07 (-0.20, 0.05)	-0.06 (-0.19, 0.06)	-0.04 (-0.16, 0.09)	-0.07 (-0.20, 0.05)
Chronic conditions (vs. no chronic conditions)					
One or more conditions	-0.15 (-0.25, -0.04)	-0.15 (-0.25, -0.04)	-0.15 (-0.25, -0.04)	-0.14 (-0.25, -0.04)	-0.15 (-0.25, -0.04)
Functional status (vs. no impairment)					
Mild impairment	0.10 (0.01, 0.18)	0.10 (0.02, 0.18)	0.10 (0.02, 0.18)	0.10 (0.02, 0.18)	0.10 (0.02, 0.18)
Moderate impairment	-0.17 (-0.38, 0.04)	-0.16 (-0.37, 0.04)	-0.16 (-0.37, 0.05)	-0.17 (-0.38, 0.04)	-0.17 (-0.37, 0.04)
Severe or total impairment	-0.73 (-1.02, -0.44)	-0.75 (-1.04, -0.45)	-0.72 (-1.02, -0.43)	-0.75 (-1.04, -0.46)	-0.73 (-1.02, -0.44)
Depressive symptoms (vs. score of < 10)					
score of ≥ 10	-0.07 (-0.14, 0.01)	-0.08 (-0.15, -0.01)	-0.07 (-0.14, 0.00)	-0.07 (-0.15, -0.00)	-0.08 (-0.15, -0.00)
Smoking status (vs. never smoker)					
Occasional smoker	-0.10 (-0.29, 0.08)	-0.11 (-0.29, 0.08)	-0.11 (-0.29, 0.08)	-0.09 (-0.27, 0.10)	-0.10 (-0.29, 0.08)
Daily smoker	-0.06 (-0.19, 0.06)	-0.07 (-0.19, 0.06)	-0.07 (-0.19, 0.06)	-0.06 (-0.19, 0.06)	-0.07 (-0.19, 0.06)
Alcohol use (vs. never)					
Less than once per month	0.03 (-0.07, 0.14)	0.04 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.04 (-0.07, 0.14)	0.03 (-0.07, 0.14)
1-3 per month	0.12 (0.02, 0.22)	0.12 (0.02, 0.22)	0.12 (0.02, 0.22)	0.12 (0.02, 0.22)	0.12 (0.02, 0.22)
1 or more times a week	0.07 (-0.02, 0.16)	0.07 (-0.02, 0.17)	0.07 (-0.02, 0.16)	0.08 (-0.01, 0.17)	0.07 (-0.02, 0.17)
FSS*Time (vs. baseline)					
Follow-up 1	0.00 (-0.09, 0.09)	-0.01 (-0.09, 0.07)	0.00 (-0.08, 0.08)	0.02 (-0.05, 0.10)	-0.03 (-0.12, 0.06)
Follow-up 2	0.06 (-0.04, 0.15)	0.04 (-0.05, 0.12)	0.04 (-0.05, 0.12)	0.06 (-0.02, 0.14)	0.03 (-0.07, 0.13)

Source: From Haghghi et al. (2025) *Supplementary Appendix: All Base and Fully Adjusted Regression Models Stratified by Baseline Marital Status*, by Haghghi, P., 2024, figshare. <https://doi.org/10.6084/m9.figshare.27190908>. This is an online resource under the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Table J2. Fully Adjusted Regression Models for the Association Between FSS and Memory – WDS at Baseline

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.07 (-0.06, 0.20)	0.05 (-0.05, 0.15)	0.08 (-0.03, 0.19)	0.04 (-0.08, 0.15)	0.05 (-0.05, 0.16)
Time (vs. baseline)					
Follow-up 1	-0.36 (-0.96, 0.24)	-0.41 (-0.89, 0.07)	-0.19 (-0.73, 0.34)	-0.33 (-0.90, 0.23)	-0.25 (-0.76, 0.26)
Follow-up 2	0.07 (-0.56, 0.71)	0.10 (-0.42, 0.62)	0.03 (-0.54, 0.59)	-0.00 (-0.60, 0.60)	0.09 (-0.45, 0.63)
Sex (vs. male)					
Female	1.05 (0.89, 1.21)	1.06 (0.90, 1.22)	1.05 (0.89, 1.21)	1.06 (0.90, 1.22)	1.06 (0.90, 1.22)
Age (vs. 45-54 years)					
55-64 years	-0.07 (-0.27, 0.13)	-0.08 (-0.28, 0.12)	-0.08 (-0.28, 0.13)	-0.07 (-0.27, 0.13)	-0.07 (-0.27, 0.13)
65-74 years	-0.20 (-0.42, 0.03)	-0.20 (-0.43, 0.03)	-0.20 (-0.43, 0.03)	-0.19 (-0.41, 0.04)	-0.19 (-0.42, 0.03)
≥ 75 years	-0.86 (-1.10, -0.61)	-0.86 (-1.11, -0.62)	-0.86 (-1.11, -0.61)	-0.84 (-1.09, -0.59)	-0.85 (-1.10, -0.60)
Province (vs. Ontario)					
Alberta	0.09 (-0.17, 0.36)	0.09 (-0.17, 0.36)	0.09 (-0.18, 0.35)	0.09 (-0.18, 0.35)	0.09 (-0.18, 0.35)
British Columbia	0.05 (-0.20, 0.30)	0.05 (-0.21, 0.30)	0.05 (-0.21, 0.30)	0.05 (-0.21, 0.30)	0.04 (-0.21, 0.30)
Manitoba	0.11 (-0.19, 0.41)	0.11 (-0.19, 0.41)	0.11 (-0.19, 0.41)	0.11 (-0.19, 0.41)	0.11 (-0.19, 0.41)
New Brunswick	0.30 (0.00, 0.59)	0.29 (-0.01, 0.58)	0.29 (-0.00, 0.59)	0.30 (0.01, 0.60)	0.30 (0.00, 0.59)
Newfoundland & Labrador	0.27 (-0.10, 0.65)	0.27 (-0.10, 0.65)	0.28 (-0.10, 0.65)	0.29 (-0.09, 0.66)	0.28 (-0.10, 0.65)
Nova Scotia	0.23 (-0.07, 0.54)	0.23 (-0.08, 0.53)	0.23 (-0.07, 0.54)	0.23 (-0.07, 0.54)	0.24 (-0.07, 0.54)
Prince Edward Island	-0.06 (-0.40, 0.28)	-0.07 (-0.41, 0.28)	-0.06 (-0.40, 0.29)	-0.06 (-0.40, 0.28)	-0.06 (-0.40, 0.28)
Quebec	0.12 (-0.09, 0.33)	0.11 (-0.11, 0.32)	0.12 (-0.09, 0.33)	0.12 (-0.09, 0.33)	0.12 (-0.09, 0.33)
Saskatchewan	0.08 (-0.25, 0.41)	0.08 (-0.26, 0.41)	0.08 (-0.26, 0.41)	0.09 (-0.25, 0.42)	0.08 (-0.25, 0.42)
Education (vs. less than high school)					
High school diploma	0.28 (-0.02, 0.59)	0.28 (-0.02, 0.59)	0.28 (-0.02, 0.59)	0.28 (-0.02, 0.59)	0.29 (-0.02, 0.59)
Some post-secondary education	0.44 (0.09, 0.79)	0.45 (0.10, 0.80)	0.44 (0.08, 0.79)	0.44 (0.09, 0.80)	0.44 (0.09, 0.80)
Post-secondary diploma/degree	0.46 (0.20, 0.72)	0.46 (0.20, 0.73)	0.46 (0.19, 0.72)	0.46 (0.19, 0.72)	0.46 (0.20, 0.73)
Annual household income (vs. $\leq$ \$19,999)					
\$ 20,000 – 49,999	0.18 (-0.01, 0.38)	0.18 (-0.01, 0.38)	0.18 (-0.01, 0.38)	0.19 (-0.01, 0.38)	0.19 (0.00, 0.38)
\$ 50,000 – 99,999	0.40 (0.19, 0.62)	0.41 (0.19, 0.63)	0.41 (0.19, 0.62)	0.40 (0.19, 0.62)	0.41 (0.20, 0.63)
\$ 100,000 – 149,999	0.61 (0.33, 0.89)	0.62 (0.33, 0.90)	0.61 (0.33, 0.89)	0.61 (0.33, 0.90)	0.62 (0.33, 0.90)

≥ \$ 150,000	0.61 (0.26, 0.96)	0.62 (0.27, 0.96)	0.61 (0.27, 0.96)	0.62 (0.27, 0.97)	0.63 (0.28, 0.97)
Living arrangement (vs. living alone)					
Living with others	-0.16 (-0.29, -0.03)	-0.17 (-0.30, -0.04)	-0.15 (-0.29, -0.02)	-0.15 (-0.28, -0.01)	-0.16 (-0.29, -0.02)
Chronic conditions (vs. no chronic conditions)					
One or more conditions	-0.17 (-0.45, 0.12)	-0.17 (-0.45, 0.12)	-0.17 (-0.45, 0.12)	-0.17 (-0.46, 0.12)	-0.17 (-0.46, 0.12)
Functional status (vs. no impairment)					
Mild impairment	0.03 (-0.12, 0.18)	0.03 (-0.12, 0.18)	0.03 (-0.12, 0.18)	0.03 (-0.12, 0.18)	0.03 (-0.12, 0.18)
Moderate impairment	-0.59 (-0.92, -0.26)	-0.60 (-0.93, -0.27)	-0.59 (-0.92, -0.26)	-0.59 (-0.92, -0.26)	-0.58 (-0.91, -0.25)
Severe or total impairment	-0.60 (-1.08, -0.12)	-0.64 (-1.12, -0.16)	-0.58 (-1.06, -0.09)	-0.60 (-1.08, -0.12)	-0.59 (-1.07, -0.11)
Depressive symptoms (vs. score of < 10)					
score of ≥ 10	-0.17 (-0.31, -0.03)	-0.18 (-0.31, -0.04)	-0.17 (-0.31, -0.03)	-0.18 (-0.32, -0.04)	-0.18 (-0.32, -0.04)
Smoking status (vs. never smoker)					
Occasional smoker	0.05 (-0.31, 0.41)	0.06 (-0.30, 0.42)	0.04 (-0.32, 0.40)	0.06 (-0.30, 0.42)	0.05 (-0.30, 0.41)
Daily smoker	0.09 (-0.13, 0.31)	0.08 (-0.13, 0.30)	0.09 (-0.13, 0.30)	0.09 (-0.13, 0.31)	0.09 (-0.13, 0.30)
Alcohol use (vs. never)					
Less than once per month	0.05 (-0.15, 0.25)	0.05 (-0.14, 0.25)	0.05 (-0.15, 0.25)	0.05 (-0.14, 0.25)	0.05 (-0.14, 0.25)
1-3 per month	0.21 (0.01, 0.41)	0.21 (0.01, 0.41)	0.20 (0.00, 0.40)	0.21 (0.01, 0.41)	0.20 (0.00, 0.41)
1 or more times a week	0.05 (-0.14, 0.24)	0.06 (-0.13, 0.25)	0.05 (-0.14, 0.24)	0.06 (-0.13, 0.25)	0.06 (-0.13, 0.24)
FSS*Time (vs. baseline)					
Follow-up 1	0.07 (-0.07, 0.22)	0.09 (-0.03, 0.21)	0.03 (-0.10, 0.16)	0.07 (-0.07, 0.20)	0.04 (-0.08, 0.16)
Follow-up 2	-0.02 (-0.17, 0.13)	-0.03 (-0.16, 0.10)	-0.01 (-0.15, 0.12)	-0.00 (-0.15, 0.14)	-0.03 (-0.15, 0.10)

Source: From Haghighi et al. (2025) *Supplementary Appendix: All Base and Fully Adjusted Regression Models Stratified by Baseline Marital Status*, by Haghighi, P., 2024, figshare. <https://doi.org/10.6084/m9.figshare.27190908>. This is an online resource under the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β: regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Table J3. Fully Adjusted Regression Models for the Association Between FSS and Memory – Single at Baseline

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.00 (-0.17, 0.17)	-0.01 (-0.15, 0.13)	0.03 (-0.13, 0.19)	-0.01 (-0.17, 0.15)	0.01 (-0.13, 0.15)
Time (vs. baseline)					
Follow-up 1	-0.07 (-0.82, 0.67)	-0.07 (-0.66, 0.53)	-0.09 (-0.81, 0.62)	-0.05 (-0.78, 0.67)	0.10 (-0.51, 0.71)
Follow-up 2	0.15 (-0.69, 0.99)	0.26 (-0.41, 0.92)	0.32 (-0.47, 1.12)	-0.15 (-0.98, 0.69)	0.37 (-0.32, 1.06)
Sex (vs. male)					
Female	1.01 (0.77, 1.24)	1.01 (0.78, 1.25)	1.00 (0.77, 1.23)	1.00 (0.77, 1.24)	1.02 (0.78, 1.25)
Age (vs. 45-54 years)					
55-64 years	-0.10 (-0.32, 0.12)	-0.10 (-0.32, 0.12)	-0.10 (-0.33, 0.12)	-0.10 (-0.32, 0.13)	-0.10 (-0.32, 0.12)
65-74 years	-0.28 (-0.58, 0.01)	-0.28 (-0.57, 0.01)	-0.28 (-0.58, 0.01)	-0.28 (-0.57, 0.01)	-0.28 (-0.57, 0.01)
≥ 75 years	-0.95 (-1.34, -0.56)	-0.95 (-1.34, -0.56)	-0.95 (-1.34, -0.56)	-0.95 (-1.34, -0.56)	-0.95 (-1.34, -0.56)
Province (vs. Ontario)					
Alberta	-0.20 (-0.69, 0.28)	-0.20 (-0.69, 0.28)	-0.20 (-0.68, 0.28)	-0.21 (-0.69, 0.28)	-0.20 (-0.69, 0.28)
British Columbia	-0.11 (-0.53, 0.32)	-0.11 (-0.54, 0.31)	-0.10 (-0.53, 0.32)	-0.10 (-0.53, 0.32)	-0.12 (-0.54, 0.31)
Manitoba	0.25 (-0.32, 0.83)	0.24 (-0.33, 0.82)	0.25 (-0.33, 0.82)	0.26 (-0.32, 0.83)	0.24 (-0.34, 0.81)
New Brunswick	-0.47 (-1.00, 0.06)	-0.47 (-1.00, 0.06)	-0.47 (-1.00, 0.05)	-0.46 (-0.99, 0.07)	-0.47 (-1.00, 0.06)
Newfoundland & Labrador	0.03 (-0.53, 0.58)	0.03 (-0.53, 0.58)	0.03 (-0.53, 0.58)	0.03 (-0.53, 0.58)	0.03 (-0.52, 0.59)
Nova Scotia	-0.02 (-0.55, 0.50)	-0.03 (-0.55, 0.50)	-0.03 (-0.55, 0.49)	-0.01 (-0.53, 0.51)	-0.03 (-0.55, 0.50)
Prince Edward Island	0.05 (-0.60, 0.70)	0.05 (-0.60, 0.69)	0.05 (-0.59, 0.70)	0.05 (-0.60, 0.70)	0.05 (-0.60, 0.70)
Quebec	-0.17 (-0.48, 0.15)	-0.17 (-0.48, 0.14)	-0.17 (-0.48, 0.14)	-0.17 (-0.48, 0.15)	-0.17 (-0.48, 0.14)
Saskatchewan	-0.43 (-0.96, 0.10)	-0.43 (-0.96, 0.11)	-0.43 (-0.96, 0.10)	-0.43 (-0.97, 0.10)	-0.42 (-0.96, 0.11)
Education (vs. less than high school)					
High school diploma	0.67 (0.06, 1.29)	0.67 (0.05, 1.29)	0.67 (0.05, 1.29)	0.68 (0.06, 1.29)	0.66 (0.05, 1.28)
Some post-secondary education	0.78 (0.10, 1.46)	0.77 (0.10, 1.45)	0.78 (0.10, 1.46)	0.78 (0.10, 1.46)	0.77 (0.09, 1.45)
Post-secondary diploma/degree	0.82 (0.28, 1.36)	0.82 (0.27, 1.36)	0.82 (0.28, 1.36)	0.82 (0.28, 1.36)	0.81 (0.27, 1.35)
Annual household income (vs. $\leq$ \$19,999)					
\$ 20,000 – 49,999	0.05 (-0.23, 0.33)	0.06 (-0.23, 0.34)	0.05 (-0.23, 0.33)	0.05 (-0.23, 0.33)	0.06 (-0.22, 0.34)
\$ 50,000 – 99,999	0.33 (0.02, 0.65)	0.34 (0.03, 0.65)	0.33 (0.02, 0.65)	0.33 (0.02, 0.65)	0.34 (0.03, 0.66)
\$ 100,000 – 149,999	0.30 (-0.11, 0.70)	0.31 (-0.10, 0.71)	0.29 (-0.12, 0.70)	0.29 (-0.12, 0.70)	0.31 (-0.10, 0.72)

$\geq \$ 150,000$	0.72 (0.23, 1.21)	0.73 (0.24, 1.22)	0.72 (0.22, 1.21)	0.72 (0.23, 1.21)	0.74 (0.25, 1.23)
Living arrangement (vs. living alone)					
Living with others	0.10 (-0.11, 0.31)	0.11 (-0.11, 0.32)	0.10 (-0.11, 0.31)	0.10 (-0.11, 0.31)	0.11 (-0.10, 0.32)
Chronic conditions (vs. no chronic conditions)					
One or more conditions	-0.08 (-0.51, 0.35)	-0.09 (-0.52, 0.35)	-0.08 (-0.51, 0.35)	-0.08 (-0.51, 0.35)	-0.08 (-0.51, 0.35)
Functional status (vs. no impairment)					
Mild impairment	0.17 (-0.08, 0.42)	0.17 (-0.08, 0.42)	0.17 (-0.08, 0.42)	0.18 (-0.07, 0.43)	0.17 (-0.08, 0.42)
Moderate impairment	0.14 (-0.42, 0.70)	0.15 (-0.41, 0.71)	0.15 (-0.41, 0.71)	0.15 (-0.41, 0.71)	0.13 (-0.43, 0.69)
Severe or total impairment	-0.20 (-0.94, 0.54)	-0.19 (-0.93, 0.56)	-0.19 (-0.93, 0.55)	-0.20 (-0.94, 0.54)	-0.20 (-0.94, 0.54)
Depressive symptoms (vs. score of < 10)					
score of ≥ 10	-0.01 (-0.21, 0.19)	-0.01 (-0.21, 0.18)	-0.00 (-0.20, 0.20)	-0.02 (-0.22, 0.18)	-0.02 (-0.22, 0.18)
Smoking status (vs. never smoker)					
Occasional smoker	0.05 (-0.42, 0.52)	0.06 (-0.42, 0.53)	0.05 (-0.42, 0.52)	0.04 (-0.43, 0.52)	0.06 (-0.42, 0.53)
Daily smoker	-0.20 (-0.54, 0.13)	-0.20 (-0.54, 0.14)	-0.20 (-0.54, 0.14)	-0.21 (-0.54, 0.13)	-0.20 (-0.54, 0.14)
Alcohol use (vs. never)					
Less than once per month	0.19 (-0.11, 0.49)	0.20 (-0.10, 0.50)	0.20 (-0.10, 0.50)	0.17 (-0.13, 0.47)	0.20 (-0.10, 0.50)
1-3 per month	0.01 (-0.30, 0.33)	0.02 (-0.30, 0.33)	0.02 (-0.30, 0.33)	0.01 (-0.31, 0.32)	0.02 (-0.30, 0.33)
1 or more times a week	0.29 (-0.01, 0.58)	0.30 (0.00, 0.59)	0.29 (-0.00, 0.59)	0.28 (-0.02, 0.57)	0.30 (0.00, 0.59)
FSS*Time (vs. baseline)					
Follow-up 1	0.04 (-0.15, 0.23)	0.04 (-0.11, 0.19)	0.04 (-0.13, 0.22)	0.03 (-0.14, 0.21)	-0.00 (-0.16, 0.15)
Follow-up 2	-0.01 (-0.22, 0.20)	-0.04 (-0.20, 0.13)	-0.05 (-0.24, 0.14)	0.07 (-0.13, 0.27)	-0.07 (-0.24, 0.11)

Source: From Haghighi et al. (2025) *Supplementary Appendix: All Base and Fully Adjusted Regression Models Stratified by Baseline Marital Status*, by Haghighi, P., 2024, figshare. <https://doi.org/10.6084/m9.figshare.27190908>. This is an online resource under the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Appendix K

Tables for the Regression Models with Multiple Imputation

Table K1. Multiple Imputation: Fully Adjusted Regression Models for the Association Between FSS and Memory (n = 10,318)

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.09 (0.04, 0.13)	0.04 (0.00, 0.08)	0.06 (0.02, 0.10)	0.07 (0.03, 0.11)	0.08 (0.04, 0.12)
Time (vs. baseline)					
Follow-up 1	-0.09 (-0.33, 0.14)	-0.14 (-0.34, 0.06)	-0.12 (-0.34, 0.10)	-0.05 (-0.26, 0.17)	-0.03 (-0.25, 0.20)
Follow-up 2	-0.06 (-0.31, 0.19)	-0.03 (-0.24, 0.19)	-0.04 (-0.27, 0.18)	-0.09 (-0.32, 0.13)	0.05 (-0.18, 0.28)
Sex (vs. male)					
Female	1.07 (1.02, 1.12)	1.08 (1.03, 1.13)	1.07 (1.02, 1.12)	1.07 (1.02, 1.12)	1.07 (1.02, 1.12)
Age (vs. 45-54 years)					
55-64 years	-0.05 (-0.10, 0.01)	-0.05 (-0.10, 0.01)	-0.04 (-0.10, 0.01)	-0.04 (-0.10, 0.01)	-0.04 (-0.10, 0.01)
65-74 years	-0.29 (-0.36, -0.23)	-0.29 (-0.36, -0.22)	-0.29 (-0.36, -0.22)	-0.29 (-0.36, -0.22)	-0.29 (-0.36, -0.22)
≥ 75 years	-0.90 (-0.99, -0.82)	-0.90 (-0.99, -0.82)	-0.90 (-0.99, -0.82)	-0.90 (-0.98, -0.81)	-0.90 (-0.99, -0.82)
Province (vs. Ontario)					
Alberta	0.04 (-0.06, 0.14)	0.04 (-0.06, 0.13)	0.04 (-0.06, 0.13)	0.04 (-0.06, 0.13)	0.04 (-0.06, 0.13)
British Columbia	0.12 (0.03, 0.21)	0.12 (0.03, 0.21)	0.12 (0.03, 0.21)	0.12 (0.03, 0.21)	0.12 (0.03, 0.21)
Manitoba	0.00 (-0.11, 0.12)	0.00 (-0.11, 0.12)	0.00 (-0.11, 0.12)	0.00 (-0.11, 0.12)	0.00 (-0.11, 0.12)
New Brunswick	-0.08 (-0.20, 0.03)	-0.09 (-0.20, 0.03)	-0.08 (-0.20, 0.03)	-0.08 (-0.20, 0.03)	-0.09 (-0.20, 0.03)
Newfoundland & Labrador	-0.03 (-0.16, 0.09)	-0.03 (-0.16, 0.09)	-0.03 (-0.15, 0.09)	-0.03 (-0.15, 0.09)	-0.03 (-0.16, 0.09)
Nova Scotia	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)
Prince Edward Island	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)
Quebec	-0.04 (-0.12, 0.04)	-0.04 (-0.12, 0.04)	-0.04 (-0.12, 0.04)	-0.03 (-0.11, 0.05)	-0.04 (-0.12, 0.05)
Saskatchewan	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)
Education (vs. less than high school)					
High school diploma	0.31 (0.18, 0.44)	0.31 (0.18, 0.44)	0.31 (0.18, 0.44)	0.31 (0.18, 0.44)	0.31 (0.18, 0.44)
Some post-secondary education	0.50 (0.35, 0.64)	0.50 (0.35, 0.65)	0.50 (0.35, 0.64)	0.50 (0.35, 0.64)	0.50 (0.35, 0.65)
Post-secondary diploma/degree	0.61 (0.50, 0.73)	0.62 (0.50, 0.73)	0.61 (0.50, 0.73)	0.61 (0.50, 0.73)	0.62 (0.50, 0.73)

Annual household income (vs. $\leq$ \$19,999)					
\$ 20,000 – 49,999	0.11 (0.00, 0.22)	0.12 (0.01, 0.22)	0.11 (0.01, 0.22)	0.12 (0.01, 0.22)	0.12 (0.01, 0.22)
\$ 50,000 – 99,999	0.21 (0.10, 0.32)	0.22 (0.11, 0.33)	0.21 (0.10, 0.32)	0.22 (0.10, 0.33)	0.22 (0.10, 0.33)
\$ 100,000 – 149,999	0.36 (0.24, 0.48)	0.37 (0.25, 0.49)	0.37 (0.25, 0.48)	0.37 (0.25, 0.49)	0.37 (0.25, 0.48)
$\geq$ \$ 150,000	0.45 (0.33, 0.58)	0.46 (0.34, 0.59)	0.46 (0.33, 0.58)	0.46 (0.33, 0.58)	0.46 (0.33, 0.58)
Living arrangement (vs. living alone)					
Living with others	-0.07 (-0.13, -0.01)	-0.07 (-0.13, -0.01)	-0.06 (-0.12, -0.00)	-0.05 (-0.11, 0.01)	-0.08 (-0.14, -0.02)
Chronic conditions (vs. no chronic conditions)					
One or more conditions	-0.06 (-0.14, 0.02)	-0.06 (-0.14, 0.02)	-0.06 (-0.14, 0.02)	-0.06 (-0.14, 0.02)	-0.06 (-0.14, 0.02)
Functional status (vs. no impairment)					
Mild impairment	0.08 (0.02, 0.14)	0.08 (0.02, 0.14)	0.08 (0.02, 0.14)	0.08 (0.02, 0.14)	0.08 (0.02, 0.14)
Moderate impairment	-0.20 (-0.35, -0.06)	-0.21 (-0.35, -0.06)	-0.20 (-0.34, -0.05)	-0.20 (-0.35, -0.06)	-0.20 (-0.35, -0.06)
Severe or total impairment	-0.58 (-0.78, -0.38)	-0.60 (-0.80, -0.40)	-0.57 (-0.77, -0.37)	-0.58 (-0.78, -0.37)	-0.57 (-0.78, -0.37)
Depressive symptoms (vs. score of < 10)					
score of ≥ 10	-0.08 (-0.13, -0.02)	-0.09 (-0.14, -0.04)	-0.08 (-0.13, -0.02)	-0.08 (-0.14, -0.03)	-0.08 (-0.13, -0.03)
Smoking status (vs. never smoker)					
Occasional smoker	-0.07 (-0.21, 0.07)	-0.07 (-0.21, 0.07)	-0.07 (-0.21, 0.07)	-0.07 (-0.21, 0.07)	-0.07 (-0.21, 0.07)
Daily smoker	-0.02 (-0.12, 0.07)	-0.03 (-0.12, 0.07)	-0.03 (-0.12, 0.07)	-0.03 (-0.12, 0.07)	-0.03 (-0.12, 0.07)
Alcohol use (vs. never)					
Less than once per month	0.07 (-0.01, 0.14)	0.07 (-0.01, 0.14)	0.07 (-0.01, 0.14)	0.07 (-0.01, 0.14)	0.07 (-0.01, 0.14)
1-3 per month	0.15 (0.07, 0.22)	0.15 (0.07, 0.22)	0.15 (0.07, 0.22)	0.15 (0.07, 0.22)	0.15 (0.07, 0.22)
1 or more times a week	0.11 (0.04, 0.18)	0.11 (0.04, 0.18)	0.11 (0.04, 0.18)	0.11 (0.04, 0.18)	0.11 (0.04, 0.18)
FSS*Time (vs. baseline)					
Follow-up 1	0.02 (-0.03, 0.08)	0.04 (-0.01, 0.08)	0.03 (-0.02, 0.08)	0.01 (-0.04, 0.06)	0.01 (-0.04, 0.06)
Follow-up 2	0.03 (-0.03, 0.08)	0.02 (-0.03, 0.07)	0.02 (-0.03, 0.07)	0.03 (-0.02, 0.09)	0.00 (-0.05, 0.05)

Source: From Haghighi et al. (2025) *Supplementary Appendix: Tables for all Regression Models with Multiple Imputation and the Missing Data Category Method*, by Haghighi, P., 2024, figshare. <https://doi.org/10.6084/m9.figshare.27190941.v1>. This is an online resource under the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Table K2. Multiple Imputation: Fully Adjusted Regression Models for the Association Between FSS and Memory, with Marital Status Interaction Term (n = 10,318)

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.06 (-0.03, 0.15)	0.02 (-0.05, 0.09)	0.04 (-0.05, 0.12)	0.06 (-0.03, 0.14)	0.05 (-0.03, 0.13)
Marital status (vs. single)					
Widowed, divorced, or separated	0.00 (-0.41, 0.41)	0.00 (-0.31, 0.32)	-0.06 (-0.42, 0.31)	0.07 (-0.32, 0.46)	0.02 (-0.32, 0.36)
Married or common-law	-0.09 (-0.49, 0.31)	-0.04 (-0.35, 0.28)	-0.05 (-0.41, 0.31)	0.01 (-0.36, 0.38)	-0.20 (-0.55, 0.15)
FSS*Marital status (vs. single)					
Widowed, divorced, or separated	0.01 (-0.09, 0.11)	0.01 (-0.07, 0.09)	0.03 (-0.06, 0.11)	-0.01 (-0.10, 0.09)	0.00 (-0.08, 0.09)
Married or common-law	0.04 (-0.06, 0.13)	0.03 (-0.05, 0.10)	0.03 (-0.05, 0.11)	0.02 (-0.07, 0.10)	0.06 (-0.02, 0.14)
Time (vs. baseline)					
Follow-up 1	-0.10 (-0.33, 0.14)	-0.14 (-0.34, 0.06)	-0.12 (-0.33, 0.10)	-0.05 (-0.26, 0.17)	-0.03 (-0.25, 0.19)
Follow-up 2	-0.07 (-0.32, 0.18)	-0.03 (-0.24, 0.18)	-0.04 (-0.27, 0.18)	-0.10 (-0.33, 0.13)	0.04 (-0.19, 0.27)
Sex (vs. male)					
Female	1.07 (1.02, 1.12)	1.08 (1.03, 1.13)	1.07 (1.02, 1.12)	1.07 (1.02, 1.12)	1.07 (1.02, 1.12)
Age (vs. 45-54 years)					
55-64 years	-0.05 (-0.10, 0.01)	-0.05 (-0.10, 0.01)	-0.05 (-0.10, 0.01)	-0.04 (-0.10, 0.01)	-0.04 (-0.10, 0.01)
65-74 years	-0.30 (-0.36, -0.23)	-0.30 (-0.37, -0.23)	-0.30 (-0.36, -0.23)	-0.29 (-0.36, -0.22)	-0.29 (-0.36, -0.22)
≥ 75 years	-0.91 (-0.99, -0.82)	-0.91 (-0.99, -0.82)	-0.91 (-0.99, -0.82)	-0.90 (-0.98, -0.82)	-0.90 (-0.99, -0.82)
Province (vs. Ontario)					
Alberta	0.04 (-0.06, 0.13)	0.04 (-0.06, 0.13)	0.04 (-0.06, 0.13)	0.04 (-0.06, 0.13)	0.03 (-0.06, 0.13)
British Columbia	0.12 (0.03, 0.21)	0.12 (0.03, 0.21)	0.12 (0.03, 0.21)	0.12 (0.03, 0.21)	0.12 (0.03, 0.21)
Manitoba	0.00 (-0.11, 0.12)	0.00 (-0.11, 0.12)	0.00 (-0.11, 0.12)	0.00 (-0.11, 0.12)	0.00 (-0.11, 0.12)
New Brunswick	-0.09 (-0.20, 0.03)	-0.09 (-0.20, 0.03)	-0.09 (-0.20, 0.03)	-0.08 (-0.20, 0.03)	-0.09 (-0.20, 0.03)
Newfoundland & Labrador	-0.03 (-0.16, 0.09)	-0.03 (-0.16, 0.09)	-0.03 (-0.16, 0.09)	-0.03 (-0.15, 0.09)	-0.03 (-0.15, 0.09)
Nova Scotia	0.03 (-0.08, 0.14)	0.03 (-0.08, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.08, 0.14)
Prince Edward Island	-0.02 (-0.14, 0.10)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.10)
Quebec	-0.04 (-0.12, 0.04)	-0.04 (-0.12, 0.04)	-0.04 (-0.12, 0.04)	-0.03 (-0.11, 0.05)	-0.04 (-0.12, 0.05)
Saskatchewan	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)
Education (vs. less than high school)					

High school diploma	0.31 (0.18, 0.44)	0.31 (0.18, 0.44)	0.31 (0.18, 0.44)	0.31 (0.18, 0.44)	0.31 (0.18, 0.44)
Some post-secondary education	0.50 (0.35, 0.64)	0.50 (0.35, 0.65)	0.50 (0.35, 0.65)	0.50 (0.35, 0.65)	0.50 (0.35, 0.65)
Post-secondary diploma/degree	0.62 (0.50, 0.73)	0.62 (0.50, 0.73)	0.62 (0.50, 0.73)	0.61 (0.50, 0.73)	0.62 (0.50, 0.73)
Annual household income (vs. ≤ \$19,999)					
\$ 20,000 – 49,999	0.11 (0.00, 0.22)	0.11 (0.01, 0.22)	0.11 (0.00, 0.22)	0.11 (0.01, 0.22)	0.12 (0.01, 0.22)
\$ 50,000 – 99,999	0.21 (0.10, 0.32)	0.22 (0.10, 0.33)	0.21 (0.10, 0.32)	0.21 (0.10, 0.32)	0.22 (0.10, 0.33)
\$ 100,000 – 149,999	0.36 (0.24, 0.48)	0.37 (0.25, 0.49)	0.36 (0.24, 0.48)	0.36 (0.24, 0.48)	0.37 (0.25, 0.48)
≥ \$ 150,000	0.45 (0.32, 0.58)	0.46 (0.33, 0.58)	0.45 (0.32, 0.58)	0.45 (0.32, 0.58)	0.46 (0.33, 0.58)
Living arrangement (vs. living alone)					
Living with others	-0.09 (-0.17, -0.01)	-0.09 (-0.17, -0.01)	-0.08 (-0.16, -0.00)	-0.08 (-0.16, -0.00)	-0.09 (-0.17, -0.01)
Chronic conditions (vs. no chronic conditions)					
One or more conditions	-0.06 (-0.14, 0.02)	-0.06 (-0.14, 0.02)	-0.06 (-0.14, 0.02)	-0.06 (-0.14, 0.02)	-0.06 (-0.14, 0.02)
Functional status (vs. no impairment)					
Mild impairment	0.08 (0.02, 0.14)	0.08 (0.02, 0.14)	0.08 (0.02, 0.14)	0.08 (0.02, 0.14)	0.08 (0.02, 0.14)
Moderate impairment	-0.20 (-0.35, -0.06)	-0.21 (-0.35, -0.06)	-0.20 (-0.34, -0.05)	-0.20 (-0.35, -0.06)	-0.20 (-0.34, -0.06)
Severe or total impairment	-0.58 (-0.78, -0.37)	-0.59 (-0.79, -0.39)	-0.57 (-0.77, -0.37)	-0.57 (-0.78, -0.37)	-0.58 (-0.78, -0.37)
Depressive symptoms (vs. score of < 10)					
score of ≥ 10	-0.08 (-0.13, -0.02)	-0.09 (-0.14, -0.03)	-0.08 (-0.13, -0.02)	-0.08 (-0.13, -0.03)	-0.08 (-0.13, -0.03)
Smoking status (vs. never smoker)					
Occasional smoker	-0.07 (-0.21, 0.07)	-0.07 (-0.21, 0.07)	-0.07 (-0.21, 0.07)	-0.07 (-0.21, 0.07)	-0.07 (-0.21, 0.07)
Daily smoker	-0.02 (-0.12, 0.07)	-0.03 (-0.12, 0.07)	-0.02 (-0.12, 0.07)	-0.02 (-0.12, 0.07)	-0.03 (-0.12, 0.07)
Alcohol use (vs. never)					
Less than once per month	0.07 (-0.01, 0.14)	0.07 (-0.01, 0.14)	0.07 (-0.01, 0.14)	0.07 (-0.01, 0.14)	0.07 (-0.01, 0.14)
1-3 per month	0.15 (0.07, 0.22)	0.15 (0.07, 0.22)	0.15 (0.07, 0.22)	0.15 (0.07, 0.22)	0.15 (0.07, 0.22)
1 or more times a week	0.11 (0.04, 0.18)	0.11 (0.04, 0.18)	0.11 (0.04, 0.17)	0.11 (0.04, 0.18)	0.11 (0.04, 0.18)
FSS*Time (vs. baseline)					
Follow-up 1	0.03 (-0.03, 0.08)	0.04 (-0.01, 0.08)	0.03 (-0.02, 0.08)	0.01 (-0.04, 0.06)	0.01 (-0.04, 0.06)
Follow-up 2	0.03 (-0.03, 0.08)	0.02 (-0.03, 0.07)	0.02 (-0.03, 0.07)	0.03 (-0.02, 0.09)	0.00 (-0.05, 0.05)

Source: From *Haghighi et al. (2025) Supplementary Appendix: Tables for all Regression Models with Multiple Imputation and the Missing Data Category Method*, by Haghighi, P., 2024, figshare. <https://doi.org/10.6084/m9.figshare.27190941.v1>. This is an online resource under the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Appendix L

Tables for the Regression Models with the Missing Data Category

Table L1. Missing Data Category: Fully Adjusted Regression Models for the Association Between FSS and Memory (n = 10,318)

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.08 (0.04, 0.13)	0.04 (0.00, 0.08)	0.06 (0.02, 0.10)	0.06 (0.02, 0.10)	0.08 (0.04, 0.12)
Time (vs. baseline)					
Follow-up 1	-0.09 (-0.33, 0.15)	-0.14 (-0.34, 0.07)	-0.13 (-0.35, 0.09)	-0.06 (-0.28, 0.16)	-0.03 (-0.25, 0.20)
Follow-up 2	-0.07 (-0.32, 0.18)	-0.03 (-0.24, 0.18)	-0.07 (-0.28, 0.15)	-0.12 (-0.34, 0.10)	0.04 (-0.19, 0.27)
Sex (vs. male)					
Female	1.08 (1.02, 1.13)	1.08 (1.03, 1.14)	1.08 (1.03, 1.14)	1.08 (1.02, 1.13)	1.08 (1.02, 1.13)
Age (vs. 45-54 years)					
55-64 years	-0.04 (-0.10, 0.01)	-0.04 (-0.10, 0.01)	-0.03 (-0.09, 0.02)	-0.03 (-0.09, 0.02)	-0.04 (-0.09, 0.02)
65-74 years	-0.28 (-0.35, -0.21)	-0.28 (-0.35, -0.21)	-0.28 (-0.35, -0.21)	-0.27 (-0.34, -0.21)	-0.28 (-0.35, -0.21)
≥ 75 years	-0.89 (-0.97, -0.80)	-0.89 (-0.97, -0.80)	-0.89 (-0.97, -0.80)	-0.88 (-0.96, -0.80)	-0.89 (-0.97, -0.81)
Province (vs. Ontario)					
Alberta	0.03 (-0.06, 0.13)	0.03 (-0.06, 0.13)	0.03 (-0.07, 0.13)	0.03 (-0.06, 0.13)	0.03 (-0.07, 0.13)
British Columbia	0.12 (0.03, 0.21)	0.11 (0.02, 0.20)	0.11 (0.02, 0.20)	0.11 (0.02, 0.20)	0.11 (0.02, 0.20)
Manitoba	0.00 (-0.11, 0.12)	0.00 (-0.11, 0.12)	-0.00 (-0.12, 0.11)	0.00 (-0.11, 0.12)	0.00 (-0.11, 0.12)
New Brunswick	-0.09 (-0.20, 0.03)	-0.09 (-0.20, 0.03)	-0.09 (-0.20, 0.03)	-0.08 (-0.20, 0.03)	-0.09 (-0.20, 0.03)
Newfoundland & Labrador	-0.04 (-0.16, 0.09)	-0.04 (-0.16, 0.09)	-0.03 (-0.16, 0.09)	-0.03 (-0.15, 0.09)	-0.04 (-0.16, 0.09)
Nova Scotia	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)
Prince Edward Island	-0.02 (-0.14, 0.10)	-0.02 (-0.14, 0.10)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.10)
Quebec	-0.04 (-0.12, 0.04)	-0.04 (-0.12, 0.04)	-0.05 (-0.13, 0.03)	-0.03 (-0.11, 0.05)	-0.04 (-0.12, 0.04)
Saskatchewan	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)
Education (vs. less than high school)					
High school diploma	0.31 (0.18, 0.44)	0.31 (0.18, 0.44)	0.30 (0.17, 0.44)	0.30 (0.17, 0.43)	0.31 (0.18, 0.44)
Some post-secondary education	0.49 (0.35, 0.64)	0.50 (0.35, 0.64)	0.49 (0.35, 0.64)	0.49 (0.34, 0.64)	0.50 (0.35, 0.64)
Post-secondary diploma/degree	0.61 (0.49, 0.72)	0.61 (0.49, 0.73)	0.61 (0.49, 0.72)	0.60 (0.49, 0.72)	0.61 (0.50, 0.73)

<i>Missing</i>	0.42 (-0.08, 0.92)	0.41 (-0.09, 0.91)	0.40 (-0.10, 0.90)	0.41 (-0.09, 0.91)	0.41 (-0.09, 0.91)
Annual household income (vs. ≤ \$19,999)					
\$ 20,000 – 49,999	0.13 (0.02, 0.24)	0.14 (0.03, 0.24)	0.13 (0.02, 0.24)	0.14 (0.03, 0.25)	0.13 (0.03, 0.24)
\$ 50,000 – 99,999	0.24 (0.13, 0.36)	0.25 (0.14, 0.36)	0.25 (0.14, 0.36)	0.25 (0.14, 0.37)	0.25 (0.13, 0.36)
\$ 100,000 – 149,999	0.42 (0.30, 0.54)	0.42 (0.30, 0.54)	0.42 (0.30, 0.54)	0.43 (0.31, 0.55)	0.42 (0.30, 0.54)
≥ \$ 150,000	0.52 (0.39, 0.64)	0.53 (0.40, 0.65)	0.53 (0.40, 0.65)	0.53 (0.40, 0.66)	0.52 (0.39, 0.65)
<i>Missing</i>	0.17 (0.05, 0.30)	0.18 (0.06, 0.30)	0.17 (0.05, 0.30)	0.18 (0.05, 0.30)	0.18 (0.05, 0.30)
Living arrangement (vs. living alone)					
Living with others	-0.08 (-0.14, -0.02)	-0.08 (-0.14, -0.02)	-0.07 (-0.13, -0.01)	-0.07 (-0.12, -0.01)	-0.09 (-0.15, -0.03)
Chronic conditions (vs. no chronic conditions)					
One or more conditions	-0.07 (-0.15, 0.00)	-0.07 (-0.15, 0.00)	-0.07 (-0.15, 0.01)	-0.07 (-0.15, 0.01)	-0.07 (-0.15, 0.01)
<i>Missing</i>	-0.00 (-0.10, 0.10)	-0.00 (-0.10, 0.10)	0.01 (-0.09, 0.11)	0.01 (-0.09, 0.11)	-0.00 (-0.10, 0.10)
Functional status (vs. no impairment)					
Mild impairment	0.08 (0.02, 0.14)	0.08 (0.02, 0.15)	0.09 (0.03, 0.15)	0.09 (0.03, 0.15)	0.08 (0.02, 0.15)
Moderate impairment	-0.20 (-0.34, -0.06)	-0.21 (-0.35, -0.06)	-0.20 (-0.34, -0.05)	-0.20 (-0.35, -0.06)	-0.20 (-0.35, -0.06)
Severe or total impairment	-0.58 (-0.78, -0.37)	-0.59 (-0.80, -0.39)	-0.58 (-0.78, -0.38)	-0.59 (-0.79, -0.38)	-0.57 (-0.78, -0.37)
<i>Missing</i>	-0.16 (-0.34, 0.02)	-0.16 (-0.34, 0.03)	-0.15 (-0.34, 0.04)	-0.15 (-0.34, 0.04)	-0.16 (-0.34, 0.02)
Depressive symptoms (vs. score of < 10)					
score of ≥ 10	-0.07 (-0.13, -0.02)	-0.09 (-0.14, -0.04)	-0.08 (-0.14, -0.03)	-0.09 (-0.14, -0.03)	-0.08 (-0.13, -0.03)
<i>Missing</i>	-0.14 (-0.26, -0.02)	-0.14 (-0.26, -0.02)	-0.15 (-0.27, -0.03)	-0.15 (-0.27, -0.03)	-0.14 (-0.26, -0.02)
Smoking status (vs. never smoker)					
Occasional smoker	-0.07 (-0.22, 0.07)	-0.07 (-0.22, 0.07)	-0.07 (-0.22, 0.07)	-0.07 (-0.22, 0.07)	-0.07 (-0.22, 0.07)
Daily smoker	-0.03 (-0.13, 0.06)	-0.04 (-0.14, 0.06)	-0.04 (-0.14, 0.06)	-0.04 (-0.14, 0.06)	-0.04 (-0.13, 0.06)
<i>Missing</i>	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.07)	0.00 (-0.06, 0.06)	0.00 (-0.06, 0.06)	0.01 (-0.05, 0.07)
Alcohol use (vs. never)					
Less than once per month	0.06 (-0.02, 0.13)	0.06 (-0.01, 0.14)	0.06 (-0.01, 0.14)	0.06 (-0.01, 0.14)	0.06 (-0.02, 0.13)
1-3 per month	0.14 (0.06, 0.21)	0.14 (0.07, 0.22)	-0.14 (0.06, 0.21)	0.14 (0.07, 0.22)	0.14 (0.06, 0.21)
1 or more times a week	0.09 (0.02, 0.16)	0.10 (0.03, 0.17)	0.10 (0.03, 0.17)	0.10 (0.03, 0.17)	0.10 (0.03, 0.17)

<i>Missing</i>	0.17 (0.05, 0.30)	0.18 (0.05, 0.30)	0.18 (0.05, 0.31)	0.18 (0.05, 0.30)	0.17 (0.05, 0.30)
FSS*Time (vs. baseline)					
Follow-up 1	0.03 (-0.03, 0.08)	0.04 (-0.01, 0.08)	0.03 (-0.01, 0.08)	0.02 (-0.03, 0.07)	0.01 (-0.04, 0.06)
Follow-up 2	0.03 (-0.03, 0.08)	0.02 (-0.03, 0.07)	0.03 (-0.02, 0.07)	0.04 (-0.01, 0.09)	0.00 (-0.05, 0.05)

Source: From Haghighi et al. (2025) *Supplementary Appendix: Tables for all Regression Models with Multiple Imputation and the Missing Data Category Method*, by Haghighi, P., 2024, figshare. <https://doi.org/10.6084/m9.figshare.27190941.v1>. This is an online resource under the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support

Table L2. Missing Data Category: Fully Adjusted Regression Models for the Association Between FSS and Memory, with Marital Status Interaction Term (n = 10,318)

	Overall FSS	TANG	POSINT	EMOINFO	AFF
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
FSS	0.05 (-0.04, 0.15)	0.02 (-0.05, 0.09)	0.03 (-0.05, 0.11)	0.05 (-0.04, 0.13)	0.04 (-0.03, 0.12)
Marital status (vs. single)					
Widowed, divorced, or separated	-0.01 (-0.42, 0.40)	-0.00 (-0.32, 0.31)	-0.09 (-0.45, 0.28)	0.05 (-0.34, 0.45)	0.01 (-0.33, 0.35)
Married or common-law	-0.12 (-0.51, 0.28)	-0.06 (-0.37, 0.26)	-0.08 (-0.44, 0.28)	-0.03 (-0.40, 0.34)	-0.24 (-0.59, 0.10)
FSS*Marital status (vs. single)					
Widowed, divorced, or separated	0.01 (-0.09, 0.11)	0.01 (-0.07, 0.09)	0.03 (-0.06, 0.12)	-0.00 (-0.10, 0.09)	0.01 (-0.08, 0.09)
Married or common-law	0.04 (-0.05, 0.13)	0.03 (-0.05, 0.10)	0.03 (-0.05, 0.12)	0.02 (-0.07, 0.11)	0.06 (-0.02, 0.14)
Time (vs. baseline)					
Follow-up 1	-0.09 (-0.33, 0.14)	-0.14 (-0.34, 0.06)	-0.13 (-0.35, 0.09)	-0.07 (-0.29, 0.15)	-0.04 (-0.27, 0.18)
Follow-up 2	-0.07 (-0.32, 0.17)	-0.03 (-0.24, 0.18)	-0.06 (-0.28, 0.16)	-0.13 (-0.35, 0.09)	0.01 (-0.21, 0.24)
Sex (vs. male)					
Female	1.08 (1.03, 1.13)	1.09 (1.03, 1.14)	1.08 (1.03, 1.14)	1.08 (1.03, 1.14)	1.08 (1.03, 1.14)
Age (vs. 45-54 years)					
55-64 years	-0.04 (-0.10, 0.01)	-0.04 (-0.10, 0.01)	-0.04 (-0.09, 0.02)	-0.03 (-0.09, 0.02)	-0.03 (-0.09, 0.02)
65-74 years	-0.28 (-0.35, -0.22)	-0.28 (-0.35, -0.22)	-0.28 (-0.35, -0.21)	-0.28 (-0.35, -0.21)	-0.28 (-0.34, -0.21)
≥ 75 years	-0.89 (-0.97, -0.80)	-0.89 (-0.97, -0.81)	-0.89 (-0.97, -0.80)	-0.88 (-0.97, -0.80)	-0.89 (-0.97, -0.80)
Province (vs. Ontario)					
Alberta	0.03 (-0.06, 0.13)	0.03 (-0.07, 0.13)	0.03 (-0.07, 0.13)	0.03 (-0.07, 0.13)	0.03 (-0.07, 0.12)
British Columbia	0.12 (0.03, 0.21)	0.11 (0.02, 0.20)	0.11 (0.02, 0.20)	0.11 (0.02, 0.20)	0.11 (0.02, 0.20)
Manitoba	0.00 (-0.11, 0.12)	-0.00 (-0.12, 0.11)	0.00 (-0.11, 0.12)	-0.00 (-0.11, 0.11)	-0.00 (-0.12, 0.11)
New Brunswick	-0.09 (-0.20, 0.03)	-0.09 (-0.20, 0.03)	-0.09 (-0.20, 0.03)	-0.09 (-0.20, 0.03)	-0.09 (-0.21, 0.03)
Newfoundland & Labrador	-0.04 (-0.16, 0.09)	-0.04 (-0.16, 0.09)	-0.03 (-0.16, 0.09)	-0.03 (-0.16, 0.09)	-0.03 (-0.16, 0.09)
Nova Scotia	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)	0.03 (-0.07, 0.14)
Prince Edward Island	-0.02 (-0.14, 0.10)	-0.02 (-0.14, 0.10)	-0.02 (-0.14, 0.11)	-0.02 (-0.14, 0.10)	-0.02 (-0.14, 0.10)
Quebec	-0.04 (-0.12, 0.04)	-0.04 (-0.12, 0.04)	-0.04 (-0.12, 0.04)	-0.03 (-0.12, 0.05)	-0.04 (-0.12, 0.04)
Saskatchewan	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)	-0.06 (-0.18, 0.06)
Education (vs. less than high school)					

High school diploma	0.31 (0.18, 0.44)	0.31 (0.18, 0.44)	0.31 (0.17, 0.44)	0.30 (0.17, 0.44)	0.31 (0.17, 0.44)
Some post-secondary education	0.50 (0.35, 0.64)	0.50 (0.35, 0.65)	0.49 (0.35, 0.64)	0.49 (0.35, 0.64)	0.50 (0.35, 0.64)
Post-secondary diploma/degree	0.61 (0.50, 0.73)	0.61 (0.50, 0.73)	0.61 (0.49, 0.73)	0.61 (0.49, 0.72)	0.61 (0.49, 0.72)
Missing	0.41 (-0.09, 0.91)	0.41 (-0.09, 0.91)	0.41 (-0.09, 0.91)	0.41 (-0.09, 0.91)	0.40 (-0.10, 0.90)
Annual household income (vs. ≤ \$19,999)					
\$ 20,000 – 49,999	0.13 (0.02, 0.24)	0.13 (0.03, 0.24)	0.14 (0.03, 0.24)	0.14 (0.03, 0.25)	0.14 (0.03, 0.25)
\$ 50,000 – 99,999	0.24 (0.13, 0.36)	0.25 (0.14, 0.36)	0.25 (0.13, 0.36)	0.25 (0.14, 0.36)	0.25 (0.14, 0.37)
\$ 100,000 – 149,999	0.41 (0.29, 0.54)	0.42 (0.30, 0.54)	0.42 (0.30, 0.54)	0.42 (0.30, 0.54)	0.42 (0.30, 0.55)
≥ \$ 150,000	0.51 (0.39, 0.64)	0.52 (0.40, 0.65)	0.52 (0.40, 0.65)	0.52 (0.40, 0.65)	0.53 (0.40, 0.66)
Missing	0.17 (0.05, 0.30)	0.18 (0.05, 0.30)	0.17 (0.05, 0.30)	0.17 (0.05, 0.30)	0.18 (0.06, 0.30)
Living arrangement (vs. living alone)					
Living with others	-0.09 (-0.17, -0.02)	-0.09 (-0.17, -0.02)	-0.09 (-0.16, -0.01)	-0.08 (-0.16, -0.01)	-0.09 (-0.17, -0.02)
Chronic conditions (vs. no chronic conditions)					
One or more conditions	-0.07 (-0.15, 0.00)	-0.07 (-0.15, 0.00)	-0.07 (-0.15, 0.01)	-0.07 (-0.15, 0.01)	-0.07 (-0.15, 0.01)
Missing	-0.00 (-0.10, 0.10)	-0.00 (-0.10, 0.10)	0.01 (-0.09, 0.11)	0.01 (-0.09, 0.11)	0.01 (-0.09, 0.11)
Functional status (vs. no impairment)					
Mild impairment	0.08 (0.02, 0.14)	0.08 (0.02, 0.14)	0.09 (0.03, 0.15)	0.09 (0.03, 0.15)	0.09 (0.03, 0.15)
Moderate impairment	-0.20, -0.34, -0.06)	-0.21 (-0.35, -0.06)	-0.20 (-0.34, -0.05)	-0.20 (-0.35, -0.06)	-0.20 (-0.35, -0.06)
Severe or total impairment	-0.57 (-0.78, -0.37)	-0.59 (-0.79, -0.39)	-0.58 (-0.78, -0.37)	-0.58 (-0.79, -0.38)	-0.59 (-0.79, -0.38)
Missing	-0.16 (-0.34, 0.02)	-0.16 (-0.34, 0.02)	-0.15 (-0.34, 0.03)	-0.15 (-0.34, 0.04)	-0.16 (-0.34, 0.03)
Depressive symptoms (vs. score of < 10)					
score of ≥ 10	-0.07 (-0.13, -0.02)	-0.09 (-0.14, -0.03)	-0.08 (-0.14, -0.03)	-0.09 (-0.14, -0.03)	-0.09 (-0.14, -0.03)
Missing	-0.14 (-0.26, -0.02)	-0.14 (-0.26, -0.02)	-0.15 (-0.27, -0.03)	-0.15 (-0.27, -0.03)	-0.15 (-0.27, -0.03)
Smoking status (vs. never smoker)					
Occasional smoker	-0.07 (-0.22, 0.07)	-0.07 (-0.21, 0.07)	-0.07 (-0.21, 0.08)	-0.07 (-0.21, 0.08)	-0.07 (-0.21, 0.08)
Daily smoker	-0.03 (-0.13, 0.06)	-0.04 (-0.13, 0.06)	-0.04 (-0.14, 0.06)	-0.04 (-0.14, 0.06)	-0.04 (-0.14, 0.06)
Missing	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.07)	0.00 (-0.06, 0.06)	0.00 (-0.06, 0.06)	0.00 (-0.06, 0.06)
Alcohol use (vs. never)					

Less than once per month	0.06 (-0.02, 0.13)	0.06 (-0.01, 0.13)	0.06 (-0.01, 0.14)	0.06 (-0.01, 0.14)	0.06 (-0.01, 0.14)
1-3 per month	0.14 (0.06, 0.21)	0.14 (0.06, 0.22)	0.14 (0.06, 0.21)	0.14 (0.07, 0.22)	0.14 (0.06, 0.22)
1 or more times a week	0.09 (0.02, 0.16)	0.10 (0.03, 0.17)	0.10 (0.03, 0.17)	0.10 (0.03, 0.17)	0.10 (0.03, 0.17)
<i>Missing</i>	0.17 (0.05, 0.30)	0.18 (0.05, 0.30)	0.18 (0.05, 0.30)	0.18 (0.05, 0.30)	0.18 (0.05, 0.30)
FSS*Time (vs. baseline)					
Follow-up 1	0.03 (-0.03, 0.08)	0.04 (-0.01, 0.08)	0.03 (-0.02, 0.08)	0.02 (-0.03, 0.07)	0.01 (-0.03, 0.06)
Follow-up 2	0.03 (-0.03, 0.08)	0.02 (-0.03, 0.07)	0.02 (-0.02, 0.07)	0.04 (-0.01, 0.09)	0.01 (-0.04, 0.06)

Source: From Haghghi et al. (2025) *Supplementary Appendix: Tables for all Regression Models with Multiple Imputation and the Missing Data Category Method*, by Haghghi, P., 2024, figshare. <https://doi.org/10.6084/m9.figshare.27190941.v1>. This is an online resource under the Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>). This material is unchanged from its original form.

Abbreviations: AFF: Affectionate Support; β : regression coefficient; CI: Confidence Interval; EMOINFO: Emotional/Informational Support; FSS: Functional Social Support; POSINT: Positive Social Interactions; TANG: Tangible Support