

**MILD COGNITIVE IMPAIRMENT, MUTUALITY, AND COLLABORATIVE
COGNITION AMONG OLDER ADULT RELATIONSHIPS**

A Senior Thesis Proposal

by

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ABSTRACT

Mild Cognitive Impairment (MCI) is a diagnosis given to a handful of older adults which affects one's cognitive ability. With this, those in romantic relationships tend to form a caregiving/receiving dynamic. This study evaluated participants part of such dyads by collecting daily diaries that included self-reports of collaborative cognition as well as a mutuality scale. Collaborative cognition (CC) refers to a shared problem solving which these couples may utilize in their everyday lives. This mix-methods study had a total of 54 participants (N=54) of which half were the individual diagnosed with MCI (i.e., the care recipient; CR) and the other half were their partners (i.e., the care partner, CP). The results indicated that there was no significant correlation between collaborative cognition and the average mutuality scores across couples. Furthermore, the highest mutuality days (HMDs) and lowest mutuality days (LMDs) were qualitatively coded in order to investigate patterns among the types of collaborative cognition. These were further broken down into the individual reports from the CPs compared to the CRs. One of the big takeaways included feelings of burden by the CP indicated by greater LMDs when CCs in which they hold more responsibility for the CR are reported. However, the CP also does more for the CR on the HMDs. This indicates that despite the caregiver burden felt, they do not necessarily have negative feelings/experiences with their CR. Additionally, HMDs typically consisted of more enjoyable task-/event-filled days which could suggest that. Lastly, it seems that across the HMDs and LMDs, there seems to be higher agreement among the CPs compared to the CRs, indicating group differences among the two types of partners. Such findings can be significant for applied research on interventions and products for older adults living with MCI and relationship dynamics.

Keywords: MCI, Older Adults, Aging, Collaborative Cognition, Mutuality, Dyads

1. INTRODUCTION

There are many components to the cognitive process and how it evolves with aging. For some older adults, aging comes with negative cognitive changes. With this memory decay comes lapses in memory in various forms, whether that be for events of the past, or for in-the-moment decisions. There is also the increased possibility for certain neurodegenerative diseases as one ages. Among these is Mild Cognitive Impairment (MCI), which is defined as a decrease in cognitive capabilities that can later progress into a form of Alzheimer's (Petersen, 2011), but is characterized by the ability to function in everyday life, as opposed to dementia (Gauthier et al., 2006; Knopman & Petersen, 2014). Characteristic of MCI is memory "blips," or errors, which can cause inconveniences and difficulties for that individual. Due to this, individuals diagnosed with MCI who are involved in a romantic relationship naturally form a care -patient/-recipient dynamic with their partner. This can have many effects on both the individual with MCI, as well as their caregiver, such as increased stress and potential frustration.

Although there is existing research on spousal dynamics in general, as well as neurodegenerative diseases such as Alzheimer's, there is not much existing literature in regard to MCI in particular and the caregiver/partner relationship among romantic partner dyads. This leads to the need for research pertaining to MCI in this regard, which was further investigated here. In particular, the existing body of literature fails to take into consideration the potential effects of mutuality among said romantic partners when placed in these types of roles. This is a key construct for the current study. Mutuality in the scope of this subject area refers to the positive components of a relationship between the care- giver/-receiver and is made up of four dimensions: love/affection, shared pleasurable activities, shared values, and reciprocity (Archbold et al., 1990; Karlstedt et al., 2020).

1.1 Overview

The present study examines the effects of mutuality between partners. In particular, it looks into dyads in which one individual is diagnosed with MCI and evaluates their collaborative cognition instances. This is pertinent due to the gap in the existing body of knowledge for this topic area. Mutuality has many implications when it comes to caregiving. Although relationships high in mutuality are the norm for caregiving dynamics, it has been found that caregiving can in fact occur in its absence (Horowitz & Shindelman, 1983).

Collaborative cognition in the scope of this paper refers to a strategy employed by couples to remember and approach daily tasks in a manner that is interactive by nature (Barnier et al., 2008; Harris et al., 2019; Rogoff, 1998). The ways in which people interact with each other can have implications for their relationship dynamic. There are also other components to take into consideration when evaluating these dyadic interactions, such as caregiver burden and the implications that come along with this burden. Particularly, this study explored collaborative cognition instances and mutuality. In investigating this topic, a better understanding of the romantic dynamics between care partners and care recipients with MCI can be accomplished in order to create real-world applications and interventions for this population. Additionally, it is important to better understand these relationships as a person with MCI that slowly progresses into dementia will begin to need more and more support as they decline cognitively.

2. LITERATURE

2.1 Mild Cognitive Impairment

As previously mentioned, although not as commonplace and not as heavily researched in the psychological field as Alzheimer's disease, MCI is still relatively prevalent in the lives of some older adults. Over many different studies, it is found that MCI's prevalence ranges from 10

to 20 percent among those older than 65 years of age (Busse et al., 2006; Di Carlo et al., 2007; Lopez et al., 2003; Manly et al., 2008; Petersen, 2011; Plassman, 2008). As specified by Peterson (2011), MCI refers to individuals that withstand a gradual decline in cognitive abilities, especially those regarding memory, beyond the scope of typical aging. Those that are believed to be “aging successfully” - about 1 in 100 older adults - (Peterson, 2011) are those that do not experience this same decline in cognitive abilities.

Furthermore, MCI is distinguished from more severe neurodegenerative diagnoses, such as dementia, in that it does not have a monumental impact on daily functioning and abilities (Gauthier et al., 2006). This is why MCI individuals do not need classical “caregiving;” however, as they decline in cognition further, this need for support is increased. Additionally, it is relevant to establish that there are various subtypes of MCI, along with several levels of severity, and the possibility for MCI progression to Alzheimer’s (Overton et al., 2019; Palmer et al., 2008). The uniqueness of this disease from case-to-case is important to note for all research in this field, as it establishes potential confounds, as well as potential difficulties. An MCI diagnosis differentiates itself from other diagnoses such as dementia in that individuals with MCI are typically able to live and function independently in their daily lives (Knopman & Petersen, 2014). Nonetheless, when in a romantic relationship, their partner will oftentimes naturally transition into an informal caregiving role (Brodaty & Donkin, 2009). This is a large component of how certain couples interact with one another and has many implications for this study.

2.2 Dyadic Interactions

When living together or being in long-term romantic relationships, couples are likely to develop certain lifestyle dynamics. Brennan and Shaver (1995) established the existence of adult attachment styles - based on Ainsworth’s famous infant attachment styles (Ainsworth & Bell,

1970) - that translate to their behaviors in romantic dynamics. Although the details on such attachment styles are not necessary to discuss for the scope of this paper, it is important to note such constructs and their potential effects within romantic relationship dynamics.

With this, there are even more complex dynamics at play which must be taken into account for care-giver/-recipient spousal relationships. Additionally, there are factors specific to aging couples such as shared life experiences, children, and later life considerations. The lives of spouses are, by nature, intertwined (Hoppman & Gerstorf, 2016). Because of this, when there are changes in one partner's cognitive functioning, as seen with MCI, it subsequently affects not only the individual with the diagnosis, but also their spouse.

Specific to spousal caregiving for older adults diagnosed with an illness, there are even more interconnections and dynamics to consider. To emphasize the shared nature of illness in later life, Berg and colleagues (2011) found that spouses in close romantic relationships are likely to experience similar negative affect as their partner. Here, negative affect refers to feelings of emotional distress that one may experience (Watson, Clark, & Tellegen, 1988). Expressing how these feelings can be shared or transferred to romantic partners, specifically within the context of later life illness and caregiving, is vital to the study at hand.

2.3 Caregiver Burden

When an individual undergoes a disease or disability that impairs their functioning - cognitive or physical - their spouse will typically transition into a caregiving role (Brodaty & Donkin, 2009). This can be a challenging transition as it requires a new medley of responsibilities which can consist of various levels of support including emotional, physical, psychological, financial, etc. (Lara-Ruiz et al., 2019; Paradise et al, 2015). For example, partners might assist with the scheduling of daily tasks or errands, handle finances, remind their partner

of appointments, and provide daily memory assistance. All of this ties into a term known as *caregiver burden*. As highlighted by Paradise et al. (2015), there is not a lot of extensive research on caregiver burden for spouses of those diagnosed with MCI. This article attempts to further this research and finds that caregiver burden does also have a substantial effect for care partners of MCI patients.

Despite MCI not causing a physical impairment, mental functionality is still greatly impacted - this varies from case-to-case, however. With this, it is important to note that a previous study found that with a decrease in functional ability, also comes an increase in caregiver burden (Lara-Ruiz et al., 2019). In other words, those that have more severe symptoms of MCI could lead to increased caregiver burden for their spouses. More specifically, chronic caregiving stressors can lead to adverse effects on various health aspects, such as weight, and cortisol levels (stress hormones) (Savla et al., 2011). Additionally, it is important to note that there is the possibility of escalating burden with the potential transition of MCI into Alzheimer's disease. This leads to decreased normal functioning and the need for adaptation in familial roles as the diagnosed individual loses ability to contribute in the same manner (Lara-Ruiz et al., 2019). The shift in these instrumental roles to accommodate the MCI individual could lead to adverse feelings from the caregiver. Furthermore, there may be an unwillingness from the MCI individual to let go of previous roles which could be negatively affected by their cognitive decline which could lead to adversity within the couple. The shifts in these relationship dynamics due to MCI tie in the importance of mutuality.

2.4 Mutuality

Perceived mutuality between partners in a dyad can have several implications for the relationship dynamics. The findings discussed throughout this section have focused on dementia

and other forms of caregiving but may be important for MCI as well. As elaborated on by Savla and colleagues (2011), positive and negative interactions in a relationship can be indicative of romantic satisfaction and stability - linked to mutuality. Savla et al. found that such negative spousal exchanges can lead to increased stress and strain on both partners which has implications for increased health risks. This indicates a direct link to caregiver burden since there are adverse effects on the caregiver as a result of the stress caused by their role. In corroboration with this idea, Karlstedt and colleagues (2020) studied patients with Parkinson's disease and the effects on mutuality between them and their spouses on caregiver burden. By collecting data on the degree of Parkinson's disease as well as the mutuality score of both partners, it was found that greater dependency decreases partner mutuality and can lead to a greater burden. Although not looking into MCI in particular, such studies are relevant as they delve into spousal caring dynamics and mutuality.

Furthering these findings, a study by Archbold and colleagues (1990) found the inverse of this effect in that greater mutuality between partners leads to a perceived decrease in caregiver burden. Specifically, it was found that having increased mutuality along with preparedness were able to mitigate some of the role strain experienced by caregivers. Despite not being directly linked to MCI or spousal dynamics in particular, such findings still shed light on the potential effects of mutuality on burden felt by a caregiver.

On the other hand, Berg and colleagues (2011) highlight the shared effects of negative affect between close romantic partners. It is emphasized that due to the closeness of the individuals in a romantic relationship, they are likely to share not only positive, but also negative feelings. This ties into the importance of mutuality and its effects on both partners. This also leads to the potential that increased mutuality may lead to increases - rather than decreases - in

caregiver burden based on the implication of shared stressors in both partners. One component that lends itself to the shared nature of stressors is the use of collaborative cognition.

2.5 Collaborative Cognition

The concept of collaborative cognition is of particular interest in this study. It refers to interactive methods of remembering or going about daily activities employed by couples and other groups (Barnier et al., 2008; Harris et al., 2019; Rogoff, 1998). Collaborative cognition often pertains to shared problem solving. This study focuses on collaboration related to instances of memory and remembering. Due to the declining memory of older adults in general, and also the increased cognitive decline specific to those diagnosed with MCI, memory tends to be an area that needs greater collaboration among the dyads of interest in this study.

Older adults in a spousal relationship have been shown to have improved collaborative recall performance when effective communication occurred (Harris et al., 2019). Such effective communication refers to conversation between the two individuals where they actively talked through the problem. Such instances of spousal collaborative communication among dyads of older adults could include things such as shared remembering of tasks, remembering something for the other partner, or trying to recall something together. Even though all of these situations vary, the main focus of collaborative cognition remains: some form of cognition (i.e., memory) is being shared by two people in a synergistic manner.

3. CURRENT STUDY

There is not much empirical evidence regarding the nature of spousal interactions in couples affected by MCI. Although there is research concerning caregiver burden for other illnesses, there does not seem to be extensive knowledge developed in the area of MCI caregiver

burden in particular. Additionally, papers regarding spousal dynamics for care partners and care recipients with MCI specifically are also scarce. All in all, this leads to the need for the extension of such research to fill the gap in this field of cognitive aging.

The current study analyzed the data recently collected by Giannotto (2023) for meaningful patterns and relationships regarding days of high and low mutuality which allow for an in-depth exploration of mutuality as it relates to first-hand accounts of collaborative cognition instances pertaining to older couples in which one is diagnosed with Mild Cognitive Impairment.

3.1 Participants

Giannotto's (2023) study enrolled twenty-seven dyads ($N = 54$ persons). Dyads were recruited from a group of participants in the Cognitive Empowerment Program (CEP). It is a joint venture between Emory University's Brain Health Center and the Georgia Institute of Technology that acts as a research center and therapeutic program for people with MCI. Members of the CEP had been diagnosed with MCI by the Alzheimer's Disease Research Center at Emory.

The sample consisted of 27 dyads; a person diagnosed with MCI (i.e., the care recipient) ($N = 27$, $M = 74.6$, $SD = 8.26$, 10 females, 51-90 years old), and their care partner ($N = 27$, $M = 71.4$, $SD = 8.35$, 18 females, 51-90 years old). There was no age-restriction for eligibility to participate, however, it was expected that most volunteers would be over the age of 55 years old due to the nature of the study. Giannotto (2023) required that both members of a romantic dyad (i.e., spousal, or significant other) had to consent to participate in the study.

3.2 Procedures

The current study evaluated the potential relationship between instances of collaborative cognition and perceived mutuality among these dyads. The participants (both care partner and care recipient) were asked to keep a daily diary that documented their memory, stress, and sleep through a series of questions and ratings that recorded instances of collaborative cognition and memory failures. All of the participants in this study were given the option to complete the diary via an online platform (Qualtrics) or via a printed diary booklet. None of the participants chose to use the printed version, therefore, each participant participated by accessing a device (i.e. desktop, laptop, smartphone, tablet, etc.) connected to the internet.

Mutuality scales were also administered daily throughout the two-week period (see Giannotto (2023) and section 3.3 for more information). There should be 14 mutuality scores per partner - for a total of 28 per couple - in the ideal scenario that each individual completed the daily diary for the entire duration of the 14-day period. I calculated the mean mutuality score per day for each couple, for a total of 14 combined average mutuality scores if there were no missing diaries.

Additionally, the instances of collaborative cognition were qualitatively coded on a consensus basis and further analyzed for different components, such as who contributed more and what strategies were utilized (e.g., dyadic communication, external/internal memory aids, reliance on partner (Giannotto, 2023)). This consisted of the creation of a coding scheme which analyzed various meaningful components to analyze the nature of the collaborative cognition instances, such as an overview of the type of collaboration, which partner contributed more, potential strategies utilized, etc. From here, each instance was independently coded by three different researchers after which a meeting occurred to compare individual codes. This led to

discussion to highlight any discrepancies among researcher's codes and come to a final consensus. Utilizing these previously coded instances of collaborative cognition (Giannotto, 2023), a mixed-methods analysis was implemented to convert the qualitatively coded data into a quantitative variable -- the number of certain coded categories as a proportion of the total CC instances. The data were analyzed via various perspectives to see if there are any meaningful patterns among the highest and lowest mutuality days, as well as among the CPs and CRs.

3.3 Materials

The Mutuality Scale (Archbold et al., 1990) is a measure of dyadic interactions and mutuality, such as exploring past and current closeness, and confiding in one another (Horowitz & Shindelman, 1983). This was measured with questions such as "*How often do the two of you laugh together?*" Scale scores ranging from 0 to 4 are calculated for each individual on each day that they complete the diary over the 14-day period, with higher scores indicating greater mutuality among the couple.

Additionally, to understand the data analysis for H.2. and H.3., it is critical to understand the qualitative coding scheme utilized to analyze the instances of CC. This coding was completed in Giannotto's (2023) study to understand the reported instances of CC in various meaningful ways. The coding scheme utilized can be seen in Figure 1 below.

Figure 1*Collaborative Cognition Coding Scheme*

Coding Category	Description	Codes
Classification (1-9)	Type of information (the "what")	(1) Names (2) Places (3) Things (4) Events (5) Appointments (6) (Forward) Planning (7) Tasks (8) Pieces of Information (9) Study Related
Type of Remembering (1-6)	Type of memory being used	(1) Retrospective (remembering something from the past) (2) Prospective (memory for intentions) (3) Semantic (memory for knowledge-based information) (4) Episodic (memory of past events/experiences) (5) Vague/Uncodeable (6) Procedural (memory for how to do something)
Type of Collaboration (1-4)	Type of collaboration (the "how")	(1) Dyadic communication (2) Completed task/event together (3) Completed planning together (4) Uncodeable
Division of Responsibility (1-7)	How responsibilities are divided among the dyad	(1) Majority (2) Minority (3) Assisting (4) Taking over (5) Doing something initially meant for partner (6) Shared equally (7) Vague
Strategies Used (0-7)	Type of memory strategies implemented	(0) No strategies used/Vague (1) Talking about it (2) Setting things out (3) External memory aids (4) Reliance on other people (5) Reliance on partner (6) Internal memory aids (7) Being relied on by partner
Who is Impacted? (1-5)	Who benefits from the successful outcome? Who was the original goal for?	(1) CP (2) CR (3) Both (4) Someone else (5) Unsure/Vague

This coding scheme was used to get a better understanding of the nature of CC reported by coding each individual instance for every individual on all days. The categories and codes from this scheme are reflected in the table categories and numbers for the figures in the results section.

A brief explanation of the more ambiguous categories, along with what their codes mean, will be given. The Classification category aimed to capture what type of information was being collaborated on. For example, trying to remember someone's name (coded as a 1) or going grocery shopping together (coded as a 7). Furthermore, the Division of Responsibility was recorded to see who carried the greater responsibility burden for that instance of collaboration. For example, if it seemed that the person reporting the CC in their diary did most of the work, then that instance would be coded as a 1 for "majority." Their partner would then be coded as a 2 for minority, assuming that their partner reported the same instance. Additionally, if one partner began a task and then the other partner took over and finished it for them, that would be coded as a 4 for the partner that took over.

3.4 Research Questions & Hypotheses

Overall, the current study seeks to explore the implications that mutuality has on caregiver burden in caregiving context in which one partner is diagnosed with MCI. It was hypothesized that higher mutuality between dyads would have a positive effect on collaborative cognition indicated by a higher quantity of overall recorded collaborative instances for couples with a higher average mutuality score. Based on the reported results from Giannotto's (2023) study, it was already known that there were almost no negative instances reported. As none of the instances are expressed in a negative context, it was expected that a higher quantity of said instances would be associated with lower caregiver burden and high mutuality.

Furthermore, the specific qualitatively-coded sub-components of the self-reported instances of collaborative cognition were analyzed in regard to the days of high and low mutuality. Said qualitative components included the *type of information*, *the type of remembering*, *type of collaboration*, *the division of responsibility*, and *the strategies employed*

(Giannotto, 2023). Each of these subcategories were coded via consensus qualitative coding for each reported collaborative cognition instance (Giannotto, 2023). I hypothesized that on days of high and low mutuality, patterns for *type of collaboration* and *the division of responsibility* would be revealed. Based on previous literature, it is known that high mutuality is associated with positive shared interactions, such as confiding in one another (Horowitz & Shindelman, 1983). With this, significant patterns among high and low mutuality days are expected to be seen in the two previously mentioned subcategories. The reason for this is because those subcategories are the most indicative of how the partners interacted with each other as well as what their respective roles were for that interaction.

4. RESULTS

In order to gain meaningful insight into mutuality and collaborative cognition (CC), data was analyzed at the individual level (e.g., dyadic role as a caregiver or care recipient) as well as at the level of the dyad as a whole. This was geared in such a way to gather information on the three hypotheses posed: (H.1.) *a higher quantity of CC instances reported among couples will lend itself to higher average mutuality for couples across days*, (H.2.) *there will be significant patterns of qualitative coding for the “Type of Collaboration” and the (H.3.) “Division of Responsibility” categories on days of highest and lowest mutuality.*

The data was gathered on the individual level (focusing on the CP and CR separately) and on the dyadic level (the couple as a whole) on the days of highest mutuality and the days of lowest mutuality for all participants. More specifically, this represents data from each individual on distinct days - one with their highest and one with their lowest mutuality score across their study participation. The days of highest mutuality (Highest Mutuality Day - HMD) are defined

as the days in which a diary was completed by the participant and their mutuality score (between 0-4) was the highest reported among all days of which a diary was completed. The same goes for the days with the lowest mutuality score (Lowest Mutuality Day - LMD).

Importantly, note that an individual may have multiple days of highest/lowest mutuality if they scored the same on the mutuality scale for more than one day (i.e., scoring a 4.0 on mutuality for 3 out of 14 days, making them have 3 highest mutuality days). Among the CPs, there were a total of 8 individuals that had more than 1 Highest Mutuality Day (where CC was reported) with the following frequencies: 2 with 2 HMDs, 3 with 3 HMDs, 1 with 5 HMDs, 1 with 6 HMDs, and 1 with 7 HMDs. In terms of the Lowest Mutuality Days (where CC was reported) amongst the CPs, there was only 1 individual that had more than 1 LMD with 4 recorded LMDs. Among the CRs, there were a total of 19 individuals with more than 1 HMD as follows: 7 with 2 HMDs, 2 with 3 HMDs, 3 with 4 HMDs, 1 with 5 HMDs, 2 with 6 HMDs, 1 with 7 LMDs, and 3 with 11 LMDs. For the Lowest Mutuality Days, there were 8 CRs with more than 1 LMD including 5 with 2 LMDs, 2 with 3 LMDs, and 1 with 4 LMDs.

It is also important to note that individuals may not report an instance of collaborative cognition on each day. Because of this, the data was viewed from the standpoint of days “where CC was reported” in order to gain a realistic view of the data when analyzing the proportions of qualitatively coded CC instances. Additionally, meaningful insights can be made regarding the proportion of highest and lowest mutuality days during which “no CC” was reported.

With this, there were 12 CPs that had no days where CC was reported that was deemed a HMD. Additionally, there were 15 CPs that had no days where CC was reported that was considered a LMD. In terms of CRs, there were 7 that had no HMDs where CC was reported,

and 21 LMDs where no CC was reported. This leads to variability in how many days of HMD and LMD were actually able to be analyzed for the purposes of analyzing CC. The upcoming tables, therefore, utilized proportions of the total CC instances where CC was reported for CP or CR, respectively.

4.1 H.1.

The first hypothesis aimed at investigating the potential relationship between the quantity of CC instances reported across couples and the average mutuality of a couple. More specifically, the number of CC instances for each couple was calculated by getting a count of the days during which either individual in the couple reported a CC, without double counting for days in which both individuals reported a CC. The range of CC count for each couple was 0-14 with 0 meaning that neither individual in the couple reported a CC instance on any of the 14 days of the diary and 14 meaning that at least one dyad member reported an instance on all 14 days of the diary.

The reason that double counting was implemented was to minimize error and better standardize represent the accuracy of whether or not CC occurred by taking into account both partner's perspectives. For instance, it is possible that on the same day, each individual within the couple reported the same instance of CC. If double counting was not implemented, this would be counted as two instances of CC when in reality it is only 1, which could lead to skewed data. The goal in representing the information in this way to minimize this potential skew in data. Although this may not always be the case and, on occasion, it is possible that two different instances can be reported by different individuals on the same day, not double counting across the board allows for less room for error amongst making these distinctions. In other words, the

quantity of CC instances is being counted as a binary variable – it either happened or it did not for each day taking into account both partners. This reflects the perspectives of both individuals in a couple.

The average mutuality across couples was also calculated for the second component of H.1. The mutuality of both individuals within a couple per day were averaged and then all of the joint daily couple averages were further averaged together to get a final average mutuality for the couple across all diary days. In other words, the mutuality for the CR and CP on day 1 of the diary were averaged to get the average day 1 mutuality, then this was repeated for each day that a diary was complete, and finally, all of the average daily mutuality scores across the couple were averaged together to get a single average mutuality for the couple. Scores were calculated this way because of the importance and emphasis on daily distinctions for the purposes of this study regarding mutuality.

A correlation was utilized to analyze the two components of the hypothesis. Results indicated that there was a nonexistent/very small positive relationship that is not significant [$r = 0.18$, $p\text{-value} = 0.37$] between couple mutuality (as indicated above) and the quantity (total amount without double counting) of CC instances. It is important to note that almost all (94%) completed diary days were considered “high” (not “highest”) mutuality days (scored greater than 2.0). Results did not reveal a significant relationship between the two; however, the reason for this is likely due to the small sample size and, thus, low power. Additionally, almost all of the mutuality scores fell in the higher range (greater than 2.0), which is to be expected considering that these couples have typically been together for a long time and have been actively living together for many years. Due to this lack of variability in mutuality overall, it was difficult for a significant correlation between these two variables to be established. This also emphasizes the

importance of the other data collected in this study which scrutinizes each instance of CC more closely.

Amongst these findings, other statistical data related to this hypothesis are also noteworthy. This is reflected amongst the days when “no CC was reported.” On the highest days of mutuality among all participants (CPs and CRs), 40% consisted of days during which participants reported that they did not engage in collaborative cognition with their partner. On the other hand, on the days of lowest mutuality, 64% consisted of days in which no CC was reported. This data was calculated by gathering the amount of “no CC” days that coincided with days identified as highest/lowest mutuality days (Figure 2) and then finding the proportion of each of these with the total amount of highest/lowest mutuality days (Figure 3), respectively.

Figure 2

Number of Total Highest and Lowest Mutuality Days Where "No CC" was Reported

	Highest Mutuality Days	Lowest Mutuality Days	Total
CRs "no CC Reported" Days	44	26	70
CPs "no CC Reported" Days	29	25	54
Total	73	51	124

Figure 3

Number of Total Highest and Lowest Mutuality Days Where "No CC" and "CC" was Reported

	Highest Mutuality Days	Lowest Mutuality Days	Total
CRs ("no CC" and "CC" Reported)	111	39	150
CPs ("no CC" and "CC" Reported)	72	41	113
Total	183	80	263

4.2 H.2. & H.3.

Hypotheses 2 and 3 predicted the emergence of patterns amongst the Type of Collaboration (H.2.) and Division of Responsibilities (H.3). The type of collaboration category aims to analyze how the couple collaborated for that instance. The division of responsibilities category, on the other hand, reflected the dynamics concerning who put in more work/who the responsibility fell on for that instance.

The combination of all of the coding categories and subcategories (see Figure 1 and section 3.3) for every instance of CC reported allows for a clear picture of what that instance consisted of. This made it so meaningful patterns amongst these instances could be observed and further investigated as will be seen below. Noteworthy distinctions within one category and code between CP/CR and HMD/LMD are classified as proportional differences greater than 0.10. These instances are represented with corresponding highlights in the upcoming figures.

4.2.1 *Highest and Lowest Mutuality Days Across All Participants*

The first perspective taken to analyze this data was to analyze the highest and lowest mutuality days (where CC was reported) by investigating the proportions of each code for those specified days across all individuals. Here, the proportions that each category was assigned certain codes on only the highest and lowest mutuality days are seen. Then, proportions were calculated by dividing each code's frequency by the total number of highest and lowest mutuality days (where CC was reported), respectively.

This data was analyzed across all individuals, without distinction between CR and CP, to recognize any potential patterns among all participants. This emphasizes the importance that each day is experienced by an individual according to their own point of view.

Figure 4 below displays the proportions of each code represented for the highest mutuality days, lowest mutuality days, and all days. Additionally, all of the tables were combined into a single figure to group together the pertinent information for this analysis and allow for easier comparison.

Figure 4

Comparison of Highest and Lowest Mutuality Days Across All Participants

CC Coding for Highest Mutuality Days as a Proportion of Total Highest Mutuality Days (Where CC was Reported) (ALL PARTICIPANTS)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.02	0.01	0.04	0.05	0.05	0.30	0.61	0.11	0.04
Type of Remembering (1-6)		0.04	0.37	0.04	0.03	0.55	0.06			
Type of Collaboration (1-4)		0.23	0.68	0.30	0.00					
Division of Responsibility (1-7)		0.04	0.06	0.03	0.00	0.02	0.68	0.17		
Strategies Used (0-7)	0.36	0.50	0.00	0.09	0.01	0.08	0.01	0.06		
Who is Impacted? (1-5)		0.02	0.14	0.75	0.05	0.06				
CC Coding for Lowest Mutuality Days as a Proportion of Total Lowest Mutuality Days (Where CC was Reported) (ALL PARTICIPANTS)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.03	0.00	0.06	0.03	0.03	0.39	0.52	0.13	0.06
Type of Remembering (1-6)		0.00	0.32	0.03	0.00	0.65	0.10			
Type of Collaboration (1-4)		0.39	0.58	0.32	0.00					
Division of Responsibility (1-7)		0.03	0.10	0.03	0.00	0.06	0.55	0.26		
Strategies Used (0-7)	0.32	0.58	0.00	0.10	0.06	0.06	0.00	0.10		
Who is Impacted? (1-5)		0.00	0.19	0.71	0.03	0.03				
CC Coding for All Days as a Proportion of Total Days (Where CC was Reported) (ALL PARTICIPANTS)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.01	0.01	0.05	0.10	0.05	0.34	0.60	0.10	0.02
Type of Remembering (1-6)		0.03	0.40	0.04	0.02	0.57	0.07			
Type of Collaboration (1-4)		0.32	0.64	0.33	0.01					
Division of Responsibility (1-7)		0.09	0.06	0.04	0.00	0.02	0.60	0.19		
Strategies Used (0-7)	0.32	0.54	0.00	0.10	0.01	0.08	0.00	0.10		
Who is Impacted? (1-5)		0.02	0.13	0.75	0.09	0.07				

Note. The highlighted boxes across all the tables indicate proportions that, at face-value, seem to indicate a noteworthy (difference greater than 0.10) pattern. Here this is indicated by the yellow and pink highlights seen for the *Type of Collaboration* and *Division of Responsibility* categories, respectively. This is what was predicted by H.2. and H.3. For *Type of Collaboration*, the

difference between the coding frequency for “1” is 0.16. For the *Division of Responsibility* category, the difference is 0.13. However, when comparing each to the proportions for All Days, it seems that the proportion of instances of CC coded 1 for *Type of Collaboration* amongst the Lowest Mutuality Days is not abnormal with a difference of only 0.07. On the other hand, for the Highest Mutuality Days of that same category and coding number, there is a difference of 0.09 indicating a slightly more abnormal frequency compared to all days on the days of highest mutuality. Given that these numbers are not greater than 0.10, they are nominal at best with the highest proportion difference being the aforementioned 0.09.

For the *type of collaboration*, the difference was noted for the “1” coded instances. This indicated that there was a greater proportion of CC instances coded as being “dyadic communication” on the LMDs over the HMDs across all participants. It is possible that the reason for this is because couples are more likely to argue or have discussions on days of low mutuality; however, this is likely not the case since it appeared that all of the CC instances reported were identified to be seemingly positive. With this in mind, another possibility is that since they were not “complete(ing a) task/event together” or “complete(ing) planning together,” they were likely not leaving the home. This could mean that the day itself was less eventful and, therefore, lead to a lower mutuality score. Additionally, if one individual (likely the CP) was explaining or reminding their partner of something, this could have been a frustrating instance for both of them, again leading to a lower mutuality score. Nonetheless, it is also important to consider that this also could have presented an opportunity for empowerment and collaborative problem-solving in a positive manner.

For the *Division of Responsibility* category, the “6” code had a greater proportion amongst the HMDs compared to the LMDs across all participants. In other words, the CC

instances were more likely to have the responsibility “shared equally” between the CP and CR on the days of highest mutuality. A possible explanation for this is that neither partner felt that they were carrying more weight or had a greater burden for that instance, meaning that their interaction was harmonious and led to a greater mutuality score.

4.2.2 Highest and Lowest Mutuality Days Across All Care Partners (CPs)

After focusing on all of the participants collectively, another perspective was taken by focusing on only the care partners. The same method of proportion calculation as the previous figure was utilized, but with only looking at the CP data.

In separating this data, it is possible to see if there are any meaningful patterns amongst just the CPs which could be due to their individual experiences based on their respective role with the dyad and as a cognitively healthy older adult. The data is represented in Figure 5 below.

Figure 5

Comparison of Lowest and Highest Mutuality Days Across All CPs

CC Coding for Highest Mutuality Days as a Proportion of Total Highest Mutuality Days (Where CC was Reported) (ONLY CPs)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.02	0.02	0.07	0.00	0.02	0.30	0.78	0.07	0.02
Type of Remembering (1-6)		0.04	0.39	0.00	0.02	0.63	0.08			
Type of Collaboration (1-4)		0.24	0.76	0.28	0.00					
Division of Responsibility (1-7)		0.07	0.04	0.09	0.00	0.02	0.67	0.20		
Strategies Used (0-7)	0.39	0.46	0.00	0.20	0.04	0.00	0.02	0.13		
Who is Impacted? (1-5)		0.02	0.11	0.72	0.07	0.11				
CC Coding for Lowest Mutuality Days as a Proportion of Total Lowest Mutuality Days (Where CC was Reported) (ONLY CPs)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.06	0.00	0.00	0.06	0.00	0.38	0.69	0.13	0.06
Type of Remembering (1-6)		0.00	0.31	0.06	0.00	0.75	0.06			
Type of Collaboration (1-4)		0.38	0.63	0.38	0.00					
Division of Responsibility (1-7)		0.06	0.00	0.06	0.00	0.13	0.56	0.25		
Strategies Used (0-7)	0.31	0.63	0.00	0.13	0.06	0.00	0.00	0.19		
Who is Impacted? (1-5)		0.00	0.31	0.69	0.00	0.00				

Note. This figure includes the greatest number of areas with noteworthy distinctions. The *Division of Responsibility* category indicates a distinction (0.11 difference) between Highest and Lowest Mutuality Days across all CPs as predicted by H.3.; the *Type of Collaboration* category, as predicted by H.2., also has noteworthy differences with the “1” code having a difference of 0.14 and the “2” code having a difference of 0.13. Additionally, the *Type of Remembering* (0.12 difference), *Strategies Used* (0.17 difference) and *Who is Impacted?* (0.20 and 0.11 differences) categories were seen to have areas where the highest and lowest days of mutuality differed amongst the CPs.

The differences detected across the CPs for highest and lowest mutuality days already seem to have more merit than that of the previous table which look more broadly at all participants. This is evident when taking into consideration that the previous group of tables which had only 2 highlights and this set has 7.

In the *Type of Collaboration* category, the “1” (i.e., “dyadic communication”) code was seen to have a greater proportion among the LMDs than the HMDs. This is unsurprising based on the results seen across all participants previously. Here, for example, the same logical reasoning can be followed to assume that mundane instances or those with frustrating lecturing from one partner to another could be the cause of an increased proportion for lower mutuality days.

However, there is another code (“2” - “completed task/event together”) which exhibits a greater proportion amongst HMDs than LMDs. Overall, it exhibits a greater proportion than the “1” codes for both the Highest and LMDs. Nonetheless, the proportion is greater for the HMDs which might be because, in this case, on days when the couple are actively engaging in something, they are more likely to have a more exciting day and therefore, feel greater mutuality

with their partner. This could be due to a variety of reasons, the first of which being a greater amount of distractions. This would lead to the potential for less direct interaction with the partner. Additionally, there is less isolation which means that the CR may be less directly dependent upon the CP. Lastly, it could simply be that a less boring, and more event-filled day may be more enjoyable overall which leads to greater feelings of daily satisfaction which could tie into feelings of higher mutuality.

For the *Division of Responsibility* category, the “6” code is again seen to have a greater proportion for the days of highest mutuality than the days of lowest mutuality. This is again potentially pointing to days during which they feel the responsibility was “shared equally,” they likely felt less frustration and greater mutuality.

Additional categories of note were *Type of Remembering*, *Strategies Used*, and *Who Is Impacted?* For *Type of Remembering*, the “5” code was, not only greater for the days of lowest mutuality, but also much greater (by almost double) than the other number codes within that category (among both the highest and lowest mutuality days). Any instances of CC coded in this way for this category indicated that the type of memory being used was vague (i.e., not retrospective, prospective, etc.). This coding pattern commonly occurred when the couple were doing a task together that did not require these other forms of memory, which is on par with the greater proportions of “2” codes for *Type of Collaboration* (i.e., “completed task/event together). With this in mind, the same explanation can be used here in that a more exciting day, filled with more events/tasks, could lead to feelings of greater mutuality among such dyads.

The next coding category that displayed a notable distinction was *Strategies Used* for the “1” code, which indicates “talking about it,” as a memory strategy. Here, the proportion of this code for the days of lowest mutuality was greater than that of the HMDs. In conjunction with the

same reasoning from before, it is possible that “talking about it” indicates that one partner is likely explaining something to the other which could lead to frustrations on both ends, leading to lower scored mutuality days. One instance coded as “1” for this category on a LMD states “We solved the problem of his getting the wrong medication from the pharmacist.” This exemplifies a situation where communication had to occur that could potentially be frustrating for one or both partners. This also ties into the idea that one individual may be feeling the greater burden of responsibility, which is why instances coded as “shared equally” are greater on days of highest mutuality.

Lastly, is the *Who Is Impacted?* category. Here two codes were seen to have meaningful differences. For one, the “2” code, which represents that the “CR” benefited from the situation, was greater on the days of lowest mutuality. This follows a clear line of reason when it is considered that for the instances where the CR is the main beneficiary, but collaboration took place, it is likely that the CP felt some level of caregiver burden and, therefore, rated mutuality lower that day. Additionally, the “5” code indicates that (to the coders) it was unclear which person was benefiting from that CC instance. Across the CPs, this code was not present at all for the LMDs but was seen as a proportion of 0.11 on the HMDs. For the instances coded in this manner, it was common that one/both partners were completing a task of which it was unclear who the final beneficiary was. The same reasoning can be applied by linking this proportional difference to simply having a more eventful day which leads to higher mutuality scores.

4.2.3 *Highest and Lowest Mutuality Days Across All Care Recipients (CRs)*

Subsequently, the method of analysis was utilized for the care recipients. This allows for the identification of notable patterns amongst the CRs only. This can be seen in Figure 6.

Figure 6*Comparison of Lowest and Highest Mutuality Days Across All CRs*

CC Coding for Highest Mutuality Days as a Proportion of Total Highest Mutuality Days (Where CC was Reported) (ONLY CRs)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.01	0.01	0.05	0.07	0.05	0.30	0.51	0.13	0.02
Type of Remembering (1-6)		0.03	0.36	0.03	0.03	0.51	0.06			
Type of Collaboration (1-4)		0.23	0.60	0.31	0.00					
Division of Responsibility (1-7)		0.02	0.07	0.00	0.00	0.02	0.70	0.15		
Strategies Used (0-7)	0.35	0.52	0.00	0.03	0.00	0.10	0.00	0.02		
Who is Impacted? (1-5)		0.01	0.15	0.77	0.05	0.03				
CC Coding for Lowest Mutuality Days as a Proportion of Total Lowest Mutuality Days (Where CC was Reported) (ONLY CRs)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.00	0.00	0.13	0.00	0.07	0.40	0.33	0.13	0.07
Type of Remembering (1-6)		0.00	0.33	0.00	0.00	0.53	0.13			
Type of Collaboration (1-4)		0.40	0.53	0.27	0.00					
Division of Responsibility (1-7)		0.00	0.20	0.00	0.00	0.00	0.53	0.27		
Strategies Used (0-7)	0.33	0.53	0.00	0.07	0.07	0.13	0.00	0.00		
Who is Impacted? (1-5)		0.00	0.07	0.73	0.07	0.07				

Note. H.2. and H.3. predicted patterns in *Type of Collaboration* (0.17 difference) and *Division of Responsibility* (0.13, 0.17, and 0.12 differences), both of which are seen amongst the CRs between HMDs and LMDs. Additionally, there seems to be a pattern in the *Classification* category (0.18 difference) which was not previously predicted.

The differences seen between Figures 4-6 emphasize the importance of analyzing this data from the different perspectives presented. Again, it is seen that there are overall more notable differences among the CRs specifically compared to all participants (Figure 4). Furthermore, although the differences are of about the same caliber of those amongst CPs (Figure 5), some are seen in different categories and for different numbered codes.

The first code that had a notable distinction was “7” in the *Classification* category. This indicated a “task” as what the couple was executing. As per the previous explanations, this code

having a much higher proportion amongst the HMDs over the LMDs, is likely due to the nature of the day being more eventful. One instance states, “Very successful shopping excursion to a church sale. We collaborated over selecting plants for our garden and selecting pots. Then we each looked for small things that caught our interest and shared our finds when we got home. We had a great time.” It is days such as these that are marked by spending time together doing enjoyable activities that could explain why days with more “tasks”/“events” occur more on HMDs.

The next distinction was within the *Type of Collaboration* category for the “1” code. Again, it is seen that “dyadic communication” is seen to occur at a greater rate for days of lowest mutuality (see above for explanation). Additionally, this data indicates that this is not a pattern exclusive to the CPs only, demonstrating that this is something that can prove frustrating for both parties.

Across the CRs, there were many codes with notable differences amongst the HMDs and LMDs for the *Division of Responsibility* category. This includes the “2,” “6,” and “7” codes. More specifically, the “2” code indicated that the CR did the “minority” of the work for that instance and the CP helped them. Although this may seem like a positive thing, it is seen that this code is greater for the days of lowest mutuality. One possible explanation ties into the aforementioned idea that the CC responsibility is not “shared equally,” thus leading to discord between the partners. However, it is also important to bring up the possibility that the CP doing the majority of the work for the CR leads to feelings of self-worthlessness and incompetence for the CR. This could lead to the feeling that they are a burden on their CP and, therefore, a lower mutuality score. Furthermore, the “6” code indicated the CC instance having the responsibility “shared equally” and therefore, leads to a greater proportion on the HMDs (see above for

explanation). Lastly, the “7” code, which indicated vagueness regarding who held more responsibility (for the coders), was seen to have a slightly greater proportion among the days of lowest mutuality. This vagueness indicated that it was likely not equally shared between the two individuals since there was room for speculation, thus tying back to the previous explanation.

4.2.4 Highest Mutuality Days Across CPs & CRs

Another point of view considered is that of a direct comparison of the CPs and CRs on their respective highest mutuality days (where CC was reported). This will shed light on the potential effects that each individual’s role can have on their days of highest mutuality. The data seen in Figure 7 are composed of the same tables seen in Figures 5 and 6, but only focusing on the days of highest mutuality.

Figure 7

Comparison of CPs and CRs Among Highest Mutuality Days

CC Coding for Highest Mutuality Days as a Proportion of Total Highest Mutuality Days (Where CC was Reported) (ONLY CPs)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.02	0.02	0.07	0.00	0.02	0.30	0.78	0.07	0.02
Type of Remembering (1-6)		0.04	0.39	0.00	0.02	0.63	0.08			
Type of Collaboration (1-4)		0.24	0.76	0.28	0.00					
Division of Responsibility (1-7)		0.07	0.04	0.09	0.00	0.02	0.67	0.20		
Strategies Used (0-7)	0.39	0.46	0.00	0.20	0.04	0.00	0.02	0.13		
Who is Impacted? (1-5)		0.02	0.11	0.72	0.07	0.11				
CC Coding for Highest Mutuality Days as a Proportion of Total Highest Mutuality Days (Where CC was Reported) (ONLY CRs)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.01	0.01	0.05	0.07	0.05	0.30	0.51	0.13	0.02
Type of Remembering (1-6)		0.03	0.36	0.03	0.03	0.51	0.06			
Type of Collaboration (1-4)		0.23	0.60	0.31	0.00					
Division of Responsibility (1-7)		0.02	0.07	0.00	0.00	0.02	0.70	0.15		
Strategies Used (0-7)	0.35	0.52	0.00	0.03	0.00	0.10	0.00	0.02		
Who is Impacted? (1-5)		0.01	0.15	0.77	0.05	0.03				

Note. Neither of the predicted (H.2. and H.3.) categories (*Type of Collaboration* and *Division of Responsibility*) seemed to have notable distinctions among the CPs and CRs. However, other categories that did show differences were *Classification* (0.27 difference), *Type of Remembering* (0.12 difference), and *Strategies Used* (0.17 and 0.10 differences).

Analyzing the data from the perspective of the CPs vs. CRs again provides meaningful information that distinguishes itself from what was found from in the previous tables. This is seen in the categories that presented greater distinctions as well as the numbered codes.

In the *Classification* category, a greater proportion of “7” (“tasks”) coding is seen amongst the CPs than the CRs. Overall, this code was seen in greater proportion than any of the others of this category among both the CRs and CPs, however, it is possible that there was a greater proportion for the CPs specifically because they have more responsibilities on a daily basis. It is interesting to note that, although they are holding more responsibilities overall, this code is still present in great proportion amongst the HMDs, indicating that they do not necessarily impact mutuality in a negative manner.

In the *Type of Remembering* category, there is a greater proportion of “5” (“vague”) codes among the CPs compared to the CRs. As expressed in the Highest and Lowest Mutuality Days Across All CPs section, it is likely that this difference ties into the previous coding pattern indicating that CPs engage in and report more everyday tasks that they complete with/for the CR. This leads to these “vague” codes for this category which are common for this type of collaboration.

Finally, the *Strategies Used* category included the “3” and “5” codes indicating notable differences between CPs and CRs for the HMDs. The “3” code represents “setting things out” as a means of aiding memory. There is a much greater proportion seen for the CPs for this code.

Again, tying into the CPs caregiving role, it is likely that they are the ones to utilize such strategies to help the CR. Similarly, the “5” code which indicates a “reliance on partner” was seen to be greater amongst the CRs than the CPs. This is in line with the previous line of reasoning, especially since it is seen to occur zero times among the CPs.

4.2.5 Lowest Mutuality Days Across CPs & CRs

Lastly, the same perspective as above was taken for the days of lowest mutuality. This again will shed light on important distinctions among each individual within the dyad on days during which they reported lower mutuality. This is seen in Figure 8 which takes the tables for lowest mutuality from Figures 5 and 6 and isolates them for further comparison.

Figure 8

Comparison of CPs and CRs Among Lowest Mutuality Days

CC Coding for Lowest Mutuality Days as a Proportion of Total Lowest Mutuality Days (Where CC was Reported) (ONLY CPs)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.06	0.00	0.00	0.06	0.00	0.38	0.69	0.13	0.06
Type of Remembering (1-6)		0.00	0.31	0.06	0.00	0.75	0.06			
Type of Collaboration (1-4)		0.38	0.63	0.38	0.00					
Division of Responsibility (1-7)		0.06	0.00	0.06	0.00	0.13	0.56	0.25		
Strategies Used (0-7)	0.31	0.63	0.00	0.13	0.06	0.00	0.00	0.19		
Who is Impacted? (1-5)		0.00	0.31	0.69	0.00	0.00				
CC Coding for Lowest Mutuality Days as a Proportion of Total Lowest Mutuality Days (Where CC was Reported) (ONLY CRs)										
Coding Category	0	1	2	3	4	5	6	7	8	9
Classification (1-9)		0.00	0.00	0.13	0.00	0.07	0.40	0.33	0.13	0.07
Type of Remembering (1-6)		0.00	0.33	0.00	0.00	0.53	0.13			
Type of Collaboration (1-4)		0.40	0.53	0.27	0.00					
Division of Responsibility (1-7)		0.00	0.20	0.00	0.00	0.00	0.53	0.27		
Strategies Used (0-7)	0.33	0.53	0.00	0.07	0.07	0.13	0.00	0.00		
Who is Impacted? (1-5)		0.00	0.07	0.73	0.07	0.07				

Note. Among only LMDs, there was no noteworthy distinctions seen for *Type of Collaboration* (H.2.), between CPs and CRs. However, *Division of Responsibility* (0.20 difference) (H.3.), was included. Additionally, highlighted areas include the following categories: *Classification* (0.36), *Type of Remembering* (0.22), *Strategies Used* (0.19), and *Who is Impacted?* (0.24).

Again, these different viewpoints of the same data are important to see the full picture and find meaningful patterns. With this, H.2. and H.3. were both accurate and inaccurate in their predictions based on the lens by which the data was analyzed seen in the presence of a distinction within the *Division of Responsibility* category, but not the *Type of Collaboration* category.

To begin, the *Classification* category was seen to have greater “7” (“task”) codes for the CPs than the CRs. This does not warrant further discussion based on the explanation given above for this same phenomenon among the HMDs. Similarly, for the *Type of Remembering* category, there is a greater proportion of “5” (“vague”) codes observed among the CPs than CRs (again explained above). Additionally, the “5” code for *Strategies Used* (“reliance on partner”) is also explained above. All of the aforementioned codes that were seen to have the same explanations in the previous section as this one indicate that regardless of the days being low or high mutuality, the CP takes on a caregiving role and has a majority of the tasks between the two partners. A perfect example of this is seen when a CR reports practically the same instance of CC (“She [CP] helped me remember how to use the treadmill and bicycle at the gym.”) on two different days, one of which was a LMD and the other a HMD (for the CR). On the other hand, both of these instances (reported from the CP’s perspective) were neither an LMD or HMD. Regardless of how it is looked at, this illustrates that the responsibilities oftentimes fall on the CP due to their caregiving role, and this is not something that necessarily impacts mutuality for either partner.

On the other hand, the *Division of Responsibility* category was not seen to exhibit the same behavior amongst the HMDs comparing CPs and CRs. Here, the “2” (“minority”) and “5” (“doing something initially meant for partner”) were seen to be of notable difference between

CPs and CRs. More specifically, the “2” code had a greater proportion amongst the CRs than the CPs. This is likely due to the nature of the dyadic relationship in which the CP takes a caregiving role, therefore, meaning that the CR typically does less of the work or holds less of the responsibility compared to the CPs. This ties into the greater proportion of “5” codes among the CPs, since they are more likely to do something for their partner to assist them.

Going back to the *Strategies Used* category, the “7” code was seen to be greater among the CPs than the CRs. This indicates that the CP was being “relied on by (their) partner.” Using the same logic from above, the CP is the one that is more likely to carry this caregiver burden and do things to aid the CR. Additionally, these proportion explanations are framed contextually in that this is among all of the LMDs, since greater burden on the CP could indicate both a feeling of incompetence for the CR along with said burden on the CP.

Lastly, the *Who Is Impacted?* category indicated a greater proportion for “2” (“CR”) codes among the CPs. This brings up an interesting point in that the CP is the one that is more likely to notice the work they are doing for the CR as the everyday assistance the CR receives may begin to become routine to them, and thus go more unnoticed. Additionally, this again ties into the greater burden the CP feels based on this being for the LMDs.

5. DISCUSSION

This study utilized a mixed methods approach by which mutuality and collaborative cognition were compared via qualitative coding of CC instances and frequencies. This was an extension of Giannotto’s (2023) study where many other components of daily living were also analyzed via higher level modeling. The current study distinguishes itself by expanding findings from the original study by focusing exclusively on the relationship between mutuality and collaborative cognition. Moreover, this line of research is also distinct from previous studies in

dyadic relationships with MCI in that data was collected from both members of the couple, not just one, and the data was analyzed via several different perspectives (across all participants, across CPs, across CRs, within couples, etc.). The focus on dual perspectives allowed for multiple aspects to be investigated in depth. It also emphasized the notable differences among groups of participants and within individuals.

5.1. Big Takeaways

Overall, many points were highlighted through this analysis process. The most obvious of these is the caregiver burden felt by the CP and how that affects mutuality. It is seen that there are many instances where the LMDs included greater proportions of codes that indicated that they held the majority of the responsibility, they did more tasks, the CR was the main beneficiary, or the CR did the minority of the work. This also tied into a lower mutuality score amongst the CRs in causing feelings of being incompetent or burdensome to their CP. However, it is interesting to note that the CP also does more for the CR on the HMDs. This indicates that despite the caregiver burden felt, they do not necessarily have negative feelings/experiences with their CR. However, when the responsibility is “shared equally,” there is a much greater possibility that the day will be considered a HMD.

This further ties into the overall group differences between CPs and CRs. Specifically, it seems that across the days of highest and lowest mutuality, there seems to be higher agreement among the CPs compared to the CRs. Referring back to Figures 5 and 6, although there are more categories with a noteworthy difference across the HMDs and LMDs for CRs than for CPs, the differences themselves seem to be much greater among the CPs. This is something that can again be indicative of caregiver burden because there is more variability between experiencing high or low mutuality depending on the types of collaboration between the partners for that day.

Additionally, more interesting findings indicated that HMDs typically consisted of more enjoyable task-/event-filled days. It is possible that this is simply because of the nature of the day being more positive; however, it may also be explained by the greater amount of distractions, as opposed to being cooped up at home all day with each other which creates more potential for arguments/discussions. This ties into the idea that when more discussions take place (i.e., one partner - typically CP - explains something to the other), it is more likely to be an LMD since this can lead to frustrations from both the CP and the CR.

5.5. Limitations & Future Directions

With this study, there are many components to take into consideration. For one, the sample size was low. This leads to implications for the data collected and the assumptions made. It was already mentioned that this may have greatly impacted the correlational relationship between couple mutuality and CC quantity predicted by H.1. Additionally, this particular sample is very exclusive as it was pulled from members of Emory's CEP. These members reside near/in the Atlanta area and are therefore not representative of the population of MCI spousal relationships. One way to combat all these concerns is to run this study with a much greater and diverse population.

There are also many individual differences among the participants that cannot be accounted for since MCI is a condition which varies greatly from person to person. This leads to varying levels of MCI (of which some may have already progressed to a dementia state). There are also health concerns which the participants may have which affects them further causing underlying effects which were not accounted for.

In addition to this, there were also variations among the couples in terms of how long they had been together, when they got married, when one of them took on the caregiving role,

etc. In the original study (Giannotto, 2023), the average relationship length was recorded, however, future studies could further this to address the aforementioned concerns by actively taking it into account in a more in-depth manner. This also creates the possibility for future directions that analyze the data based on different frameworks or within different contexts. For example, the length of the marriage could be correlated to the couple's average mutuality or to the type of collaboration frequencies.

It is also interesting to note that this study was conducted during the COVID-19 pandemic. This is something that could have greatly impacted both the mutuality and collaborative cognition instances of the couple. For one, it means that they were less likely to leave the home. In other words, they would potentially be having more average/mundane at-home-days as opposed to going out and doing more things. Based on the assumptions from the data collected, this could have led to days of lower mutuality. This is something that could be addressed in future studies by collected data in a time after COVID-19.

Another limitation to consider is the subjective nature of the qualitative coding used as the backbone of this study's data analysis. This method relied on individuals reading a CC instance and interpreting it in their own way. This can vary greatly from person to person and may also lead to incorrectly capturing the true nature of that CC instance. However, an attempt to combat this was made by ensuring that everything was coded on a consensus basis whereby two coders coded all of the instances individually and then came together (with the supervisor) to discuss any areas of contention between each other's codes and come to a consensus for a final code. Nonetheless, this is an area that could have skewed data and is also limited to the coding scheme developed for Giannotto's (2022) study which may leave some areas untouched. This is

a component that could be altered in future studies by utilizing more coders or developing a more complex coding scheme.

Another area that could have caused skewed data is the nature of the data itself. Since these are couples that have been together for (typically) several years, it is likely that they already have high mutualities. This was clearly demonstrated in that almost all (more than 90% among all participants) of the diary days were considered “high” mutuality (scored higher than 2.0/4.0). This makes it to where there may not be a true reflection of low mutuality days amongst the LMDs since some of them may still be considered “high” mutuality days despite being the Lowest Mutuality Day among the others for that individual. Additionally, there is the issue of having multiple days of highest and lowest mutuality among one individual. This is something that occurred across both the CPs and CRs and could lead to skewed data. In other words, it makes the experiences of those individuals seem more representative than others based on the proportions. This is something that could be treated differently in future studies by potentially choosing only one of the highest/lowest mutuality days per individual in which this situation occurs. However, the reasoning for choosing that particular one would have to be expressed.

This study presents unique and novel findings that can have real-life applications and implications that can contribute to the existing body of knowledge on caregiving dyads interactions and mutuality. The great implications that caregiver burden has upon mutuality speak to yet another factor that impacts their daily affect and relationship with the CR. Additionally, the feelings of being burdensome from the CR also have a negative impact on this relationship as they both lead to overall lower mutuality days. There is also the importance of doing more things together to create more exciting and eventful days which have indicated greater mutuality scores among both partners. These are all components that can be taken into

consideration for interventions among these caregiving dyads to help strengthen not only their daily lives, but also their relationship with one another.

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