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by

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Professor Robert W. Levenson, Chair
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Abstract

An Examination of Pronoun Usage in Dementia Patients and their Spousal Caregivers

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Pronoun usage can be a powerful way of studying individuals and their relationships with others. While much of this research has examined the use of pronouns in healthy populations, few studies have focused on more vulnerable populations like persons with dementia (PWDs) and their spousal caregivers. Dementia is a debilitating disease that can affect the socio-emotional functioning of the individuals afflicted as well as their spousal caregivers. Depending on the neural circuits of the brain impacted, PWDs can develop different patterns of impairment in cognitive, language, and socio-emotional domains. In the present study, objective measures were used to examine diagnostic differences in pronoun usage in PWDs and their spousal caregivers and the associations between pronoun usage and caregiver mental health. The sample was composed of 311 dyads (254 PWD-caregiver dyads and 57 healthy aged controls). The first aim examined diagnostic differences in the types of pronouns used and found an interaction effect between diagnostic group (behavioral-variant frontotemporal dementia; bvFTD), Alzheimer's disease (AD), and healthy controls) and partner type (PWD, caregiver, healthy partner) in that PWDs with bvFTD used significantly more I-words than all other groups while caregivers of bvFTD patients used significantly fewer I-words than all other groups. Additionally, PWDs with bvFTD used significantly fewer you-words than all other groups while caregivers of bvFTD patients used significantly more you-words than all other groups. A marginally significant interaction effect for we-words was found with PWDs with AD using the most we-words and PWDs with bvFTD using the fewest we-words. The second aim addressed in this study examined whether the types of pronouns used by PWDs and their spousal caregivers were associated with caregiver mental health at the time of caregiving. No significant association with caregiver mental health at the time of caregiving were found for any of the three pronoun types used by PWDs and caregivers. The third aim examined the association between types of pronouns used by PWDs and their spousal caregivers and caregiver mental health post-death. Hypotheses related to the third aim were not supported. This study extends our understanding of the socio-emotional impact of neurodegenerative disease on PWDs and their spousal caregivers and contributes important new information to the literature on diagnostic differences in interpersonal functioning.

Dedication

First, this dissertation is dedicated to my advisor Bob Levenson, who provided the greatest possible education on the human experience. Thank you for seeing potential in me and for patiently guiding me all these years. In no uncertain terms, you have changed my life for the better.

To my parents, Denis and Yvonne, for your love and unwavering support. And to my siblings, Denis and Kelly, for making me laugh until I get a belly ache. I love you all so much.

To my friends, lab mates, cohort, and mentors who have offered me their time, love, knowledge, and support. You have challenged me, encouraged me, and humored me and I have had the good fortune to count you as friends. There are many of you. Thank you.

And to my soon-to-be husband, Jeffrey, whose love, care, and ability to lift me out of my perpetual state of panic made this dissertation possible, proving once again that "timing is everything in this life." I am so thankful we get to share this ephemeral life together.

Introduction

An individual's use of language can convey a great deal about their daily lives, including both their intrapersonal and interpersonal worlds. Language allows us to form ideas, to manipulate them internally, and to express them. When one has to find expression for an idea or concept, one can only use the words that come to their mind. While the meaning of a word is largely dependent upon context, words in general are associated with ideas and thus words play an integral part of conveying concrete experiences and abstract thought in verbal language. The words we use hold a vast potential for informing us about ourselves and our relationships with others. Therefore, language has been a useful tool for researchers in providing a window into the individual as well as the nature of relationships.

Pronoun usage can be a powerful way of studying intrapersonal and interpersonal processes. Researchers propose that this is because the pronouns individuals use indicates where they are focusing their attention. When an individual uses first person singular pronouns like *I*, they are momentarily focusing on the self. When an individual uses first person plural pronouns like *we* or second person plural pronouns like *you* they are focusing some or all of their attention on others. Research suggests that these tiny particles of speech can actually tell us a lot about individuals and their relationships with others. Further, this phenomenon has been studied often, usually in terms of understanding individuals and their interpersonal relationships, but has rarely focused on pronoun usage as they relate to neurodegenerative diseases. The literature suggests that pronoun usage may provide keen insights into the lives of highly vulnerable populations, such as patients with dementia (PWDs) and their spousal caregivers.

In the sections that follow, research on the role of pronoun usage in understanding the person will be discussed, as well as our current understanding of pronoun usage in interpersonal relationships. This will be followed by a discussion of the behavioral manifestations of different forms of dementia in PWDs. Next, research about pronoun usage in patient populations will be reviewed, followed by a discussion of caregiver mental health and how pronouns may play a role in predicting caregiver outcomes pre-loss and post-death of the person in their care. Lastly, an outline of the current study including gaps in the literature it aims to address will be presented.

Pronoun Usage and the Individual

The pronouns that people use may provide important clues about their own thoughts and feelings (Pennebaker, Mehl, & Niederhoffer, 2003). Across several studies, results have linked pronoun usage to a number of psychological factors related to individual characteristics, personality traits, behaviors and mental health. For example, research linking specific behaviors with pronoun usage suggests that first person singular pronouns, or I-words, such as *I* or *me*, may be a marker of honesty. Newman, Pennebaker, Berry, and Richards (2001) conducted a series of studies in which participants were given a lie detector test. Participants who were more truthful in their responses used a higher number of I-words than when they were being deceptive in their responses. The researchers posited that this was because people who are deceptive take less ownership in an attempt to dissociate themselves from their statements. Additionally, an increase in the usage of I-words during a structured Type A interview was associated with an increase in Type A behaviors (Scherwitz, Graham, & Ornish, 1985), which researchers have suggested is related to the tendency of individuals with high levels of Type A behaviors to be overly self-focused (i.e., self-critical, preoccupation with status, unmitigated agency).

The use of I-words has also been strongly linked with personality. Given that narcissism is characterized by grandiosity, self-focus, and self-importance, it is unsurprising that several investigators have proposed an association with self-focused pronouns. Raskin and Shaw (1988) conducted a study in which they recorded undergraduate participants speaking about any topic of their choosing for 5 minutes. After completing this task, participants completed the Narcissistic Personality Inventory (NPI). Results revealed a positive relationship between NPI scores and use of I-words. In trying to understand the processes which underlie the relationship between narcissism and pronoun use, DeWall, Buffardi, Bonser, and Campbell (2011) found that narcissistic individuals who engaged in less self-promoting behaviors such as posting attention-grabbing images and using profanity were more likely to use more self-focused pronouns in their posts. I-words are not the only forms of pronouns that have been predictive of personality. Extraverts are more likely to use pronouns that include others, such as *we* and *you*, than introverts (Dewaele & Furnham, 2000).

In the realm of mental health, pronoun usage has differentiated between clinical and non-clinical populations. In an analysis of the published works of 18 poets, 9 of whom committed suicide, Stirman and Pennebaker (2001) found that the poets who committed suicide used higher rates of I-words and fewer references to other people. Relatedly, in another study examining pronouns in a writing task, Rude, Gortner, and Pennebaker (2004) suggested that depressed students were more likely to use a higher rate of I-words in a writing task than students who were not depressed. Additionally, investigators using electronically activated recorders, which provided an auditory sample of students' natural environment, found that students' depression ratings were related to an increased use of I-words (Mehl, 2006b). These findings suggest that the more depressed a person becomes the more they focus on themselves and less on the world around them.

A synthesis of these findings suggests that the pronouns people use can serve as a window to their personalities, where they direct their attention, as well as their emotional states. In particular, these studies suggest that the use of I-words may reflect an increased focus on the self, which can have detrimental effects on an individual's mental health.

Pronoun Usage in Interpersonal Relationships

The pronouns that people use in their interactions with relationship partners not only provide important clues about individuals but also how they relate to others and distinguish themselves from others (Seider, Hirschberger, Nelson, & Levenson, 2009; Pennebaker, Mehl, & Niederhoffer, 2003). For example, researchers have distinguished between the use of *we-ness* pronouns (i.e., we, us, ours) and *separateness* pronouns (i.e., I, me, you, yours) as indicators of how partners view themselves in relation to another person (Seider, Hirschberger, Nelson, & Levenson, 2009). According to this viewpoint, the relative use of we-words versus *separateness* pronouns, such as *you* and *I,* indicates how much a partner identifies as part of a couple versus as an autonomous individual. It is worthy to note that while studies examining pronoun use in individuals have individually isolated the effects of you-words and I-words as measures of other-focus and self-focus respectively, research examining you-words and I-words in healthy couples often examine them together as a measure of separateness.

Prior research with healthy couples has shown that *we*-word usage is related to a number of different positive relationship outcomes (Buehlman, Gottman, & Katz, 1992) including relationship commitment, intimacy, feelings of togetherness, and marital quality (Agnew, Van Lange, Rusbult, & Langston, 1998; Fitzsimons, & Kay, 2004). *We-ness* pronoun usage has also been associated with lower cardiovascular arousal and more positive emotional behavior (Seider, Hirschberger, Nelson, & Levenson, 2009) as well as more adaptive problem-solving behaviors (Simmons, Gordon, & Chambless, 2005) during a discussion about an area of disagreement. The researchers posit that couples who use more we-words have a greater sense of shared responsibility which may lead them to collaborate more effectively.

In contrast, *separateness* pronoun usage has been related to a number of negative relationship outcomes including lower marital satisfaction and more negative emotion expressed during an interaction (Sillars, Shellen, McIntosh, & Pomegranate, 1997; Seider, Hirschberger, Nelson, & Levenson, 2009). Comparing *you* and *I* variants of separateness pronouns, greater use of *you-words* has been linked with negative interaction qualities including criticism, blame, and less shared identity, while other researchers have suggested a link between more I-words use and greater self-focus (Simmons, Gordon, & Chambless, 2005). In a study of distressed and non-distressed couples, Williams-Baucom et al (2010) found that more I-words used by partners was associated with lower marital satisfaction in non-distressed couples but not distressed couples. Additionally, examining the use of you-words and I-words separately in couples may provide more information on the unique functions of each when interacting with a partner. In sum, the present literature demonstrates the predictive value of we-words, you-words, and I-words in healthy couples. Very little research however, has examined pronoun use in more vulnerable populations, such as PWDs and their spousal caregivers.

Dementia: AD vs bvFTD

Dementia is a common, age-related group of neurodegenerative disorders that ultimately results from synaptic loss and neuronal death. Depending on the particular neural circuits that are damaged, PWDs can develop quite different patterns of impairment in cognitive, language, and socio-emotional domains (Seeley et al, 2009). Much of the research has focused on two forms of dementia: Alzheimer's disease (AD), the most common form of dementia over 65, and behavioral-variant frontotemporal dementia (bvFTD), the most common form of dementia under 60.

Alzheimer's disease (AD) targets posterior brain circuits that link the hippocampus, entorhinal cortex, and parietal lobes. While this often results in deficits in memory and visuospatial abilities (Katzman, 1986; McKhann, et al., 1984), socio-emotional processing is typically preserved in early disease stages in PWDs with AD (Bucks & Radford, 2004; Goodkind, Gyurak, McCarthy, Miller, & Levenson, 2010; Lavenu, Pasquier, Lebert, Petit, & Van der Linden, 1999). As such, PWDs with AD often initially present as socially appropriate people (Sturm et al., 2010). However, they can become increasingly agitated as the disease progresses into the later stages (Levy, et al, 1996a).

In contrast, behavioral variant frontotemporal dementia (bvFTD) is a form of dementia that affects the frontal and temporal lobes of the brain, leading to breakdowns in socio-emotional processes and often unusual behaviors (Levenson & Miller, 2007, Neary et al., 1998). The neural regions of the brain impacted by bvFTD overlap with the salience network, which links the orbital frontoinsular and anterior cingulate cortices to subcortical and limbic structures. The salience network is activated in tasks that involve attention and self-regulation of behavior. As such, patients with bvFTD often have a lack of insight into their behaviors, socio-emotional impairments, and may become cold and distant as the disease progresses. Social impairments manifest in a loss of social awareness, disinhibition, reduced interest in family, social withdrawal, and apathy (Baruglia et al, 2014; Bozeat et al, 2000; Levy et al, 1996a).

Pronouns as indicator of dementia type. Although no research thus far has examined the potential of pronoun use to differentiate between an AD and bvFTD diagnosis, the literature suggests they may be linked. As previously noted, pronouns provide an indication of an individual's attentional focus. Given that the brain areas impacted by bvFTD include the neural regions in the salience network, it is likely that this would impact PWDs' attentional focus and subsequently their use of pronouns. Additionally, social impairments, including loss of social awareness, apathy, and social withdrawal, may result in patients with bvFTD using more *I*-words and less *we*-words than AD patients, who are often able to maintain their warmth and social connectedness.

Caregiver Mental Health During Caregiving

While it is clear that dementia affects the cognitive and social functioning of PWDs, it is also often detrimental to the functioning of their spousal caregivers who have to watch the deterioration of a loved one's cognitive and emotional functioning. This psychological burden often leads to chronic stress and a heightened risk for mental health problems, in addition to the negative physical health outcomes that can result from tending to an increasingly disabled spouse (Cuijpers, 2005; Cooper et al., 2007; Schulz, 1995; Schulz & Beach, 1999, Schulz & Sherwood, 2008; Pinquart et al., 2003). However, while many spousal caregivers suffer poor health, many others remain healthy.

To date the most studied negative outcomes related to dementia caregiving are psychological and physical illnesses. In their early meta-analysis of caregiving research in 1995, Shultz and colleagues found that caring for a family member with dementia was consistently associated with higher rates of clinical depression and anxiety, and greater use of psychotropic medications. In a more recent review, Pinquart and Sorenson (2007) examined over 80 studies of caregiver psychological and physical health and found a similar trend suggesting worse mental health in caregivers versus non-caregivers. Specifically, caregiving was related to increased depression, worse subjective well-being, less self-efficacy, and greater self-reported stress.

Research suggests that several patient factors may moderate the relationship between caregiving and negative health outcomes. The most consistent finding in the literature is that PWD behavioral and psychological symptoms significantly predict poorer mental health and greater stress in caregivers, above and beyond patient cognitive functioning and, in some studies, above PWD functional status (Rymer et al 2002). For example, Mourik and colleagues (2004) found that in a sample of 63 patients with frontotemporal dementia (FTD) caregiver distress was most strongly associated with patient agitation and psychosis symptoms including delusions, irritability, and hallucinations. In an earlier nationwide study of over five thousand patients with AD, Covinsky et al., (2003) found that caregiver depression was related to patient behavioral disturbances, specifically angry and aggressive behaviors (2003). In another study of AD patients, Rymer and colleagues (2002) found that patient disinhibition contributed to caregiver burden above and beyond both patient disease severity *and* functional impairment. Interestingly, there is reason to believe that differences in patient symptomatology differentially contribute to caregiver's risk of negative outcomes. Additionally, PWDs with increased cognitive and emotional declines often have caregivers who experience large increases in burden and negative mental and physical outcomes (Markowitz, Gutterman, Sadik, & Papadopoulos, 2003; Schulz & Sherwood, 2008)

Given the stable finding that PWD behavior contributes to caregiver negative outcomes, PWDs with neurodegenerative diseases that primarily manifest as behavioral symptoms may be particularly burdensome for caregivers. Because AD and bvFTD target different circuits in the brain (Seeley et al, 2009), it can be presumed that risk and resilience factors for declines in caregiver mental health will vary depending on the patient's disease. In a comparison study examining caregiver burden in AD and FTD (behavioral and language variants), researchers found that FTD caregivers were significantly more burdened than AD caregivers, and reported disinhibition as the most distressing PWD neuropsychiatric symptom (de Vugt et al, 2007). In a similar study, Mioshi and colleagues (2008) reported compared mixed-variant FTD patients to AD patients and found that FTD caregivers were much more stressed and depressed compared to AD caregivers.

Examining declines in caregiver well-being in the context of their marriage has been less explored but is crucial, because caregiver outcomes are highly impacted by the interpersonal nature of caregiving. For example, patients with FTD seem less emotionally connected to their spouses, as they show less mutual gaze during conversations and report lower marital satisfaction than do healthy controls (Sturm et al., 2011; Ascher et al., 2010). This loss of closeness between PWDs and their spousal caregivers can be detrimental, as it has been associated with worse caregiver physical health (Fauth et al., 2012). Furthermore, if marital intimacy is low before the onset of the neurodegenerative illness, or if relationship quality is poor once the PWD is ill, caregivers are more likely to report greater caregiver strain, depression, and anxiety (Morris, Morris, & Britton, 1988; Mahoney et al., 2005). Finally, Lwi et al, (2017) found that PWDs' Duchenne smiles were associated with caregivers' reports of better mental health. Findings were specific to PWD-caregiver dyads, as this association between Duchenne smiles and partners' mental health was not found in healthy older adults, which suggests that PWDs and their spousal caregivers may be especially attuned to and affected by interpersonal processes in the relationship.

Pronouns as predictors of caregivers' mental health. Several studies have examined pronoun use in couples where one partner was afflicted with a significant health problem. In a study of patients with heart disease, greater use of *we*-words by partners during an interview predicted more favorable symptom course for patients over the following six months (Rohrbaugh, Mehl, Shoham, Reilly, & Ewy, 2008). A similar finding emerged in an intervention study with smokers where greater use of *we*-words during a conflict discussion predicted greater success in smoking cessation (Rohrbaugh, et al., 2008). Investigators have also examined pronoun usage in patient-caregiver dyads during a discussion about how they cope with breast cancer, finding that *we*-words usage was associated with better dyadic adjustment and lower depressive symptoms in patients (Robbins, et al., 2012; Robbins et al., 2013). Additionally, Connelly et al., (2020) found that a higher ratio of *we*-words used by both PWDs and caregivers about an area of disagreement was associated with less caregiver distress. Taken together, these findings highlight how referencing the partnership in terms of the couple consistently has positive associations with relationship quality and well-being.

In contrast, research examining the usage of "you" and "I" in patient-caregiver dyads has illustrated more ambiguous results with certain patterns of pronoun usage being more predictive of outcomes than individual pronouns. For example, Karan, Wright, and Robbins (2016) found that pronouns which focused on the caregiving spouses of breast cancer patients (caregiver-*I* and patient-*you*) was positively associated with better dyadic adjustment for the caregiving spouses. Interestingly, the use of caregiver-focused pronouns in PWD-caregiver dyads was not significantly associated with caregiver distress (Connelly et al; 2020) but the use of patient-focused pronouns (patient-*I* and caregiver-*you*) was significantly associated with worse caregiver distress, suggesting that an increasing focus on the PWD as the disease progresses may be detrimental to the health of their caregivers.

Despite this promising work, which demonstrates that the use of pronouns during interactions between PWDs and caregivers may have predictive value, the majority of studies utilized a small sample which left the results vulnerable to low statistical power. Additionally, the researchers have limited their studies by examining only individual pronoun words. These studies do not take into account the instances when partners may use a pronoun phrase to refer to the couple (for example, "you and I"). Although the speaker is referring to the couple when using the phrase "you and I", it actually conveys separateness in comparison to "we" as the speaker is referring to each partner individually. Studying all the ways that partners' use pronouns to refer to the couple, by distinguishing between the use of *we*-words (e.g., we, us, our) and "*you and I"*-phrases (e.g., you and I, me and you) when referring to the couple, may be useful in differentiating which caregivers get sick and which remain resilient.

To illustrate this further, consider the deficits in social awareness and increasing isolation in some PWDs. Now consider the loss of closeness experienced by some caregivers. During social interactions, these may manifest in a sense of separateness which may be expressed through the types of pronouns they use. More specifically, it is likely that there would be an increase in the use of *"you and I"*-phrases, a form of separateness pronouns used to refer to the partners in the couple as separate entities, and a decrease in the use of *we*-words, a form of we-ness pronouns used to refer to the couple as a unit, and that these fluctuations in pronoun usage would be predictive of caregiver mental health.

Consider the following two conversations, where the first is characterized by a greater use of *we*-words and the second is characterized by a greater use of separateness words and phrases (*"you and I"*-phrases, *I*-words and *you*-words).[1]

1: We-words

CAREGIVER: Well now **we** have to talk about something that **we** disagree on. Now what else would **you** like to agree on or disagree on?
PWD: Well, perhaps on **our** vacations. **We** love to go on many vacations and cruises. And here and there, **you** are the guide. **You** are the historian and **you** take **us** on many travels.
CAREGIVER: And that is good?
PWD: And that is very, very good.
CAREGIVER: And **we** do not disagree on that?
PWD: **We** do not. Just the fact that sometimes **we** spend longer at different places and ten, twelve days is quite a long time.
CAREGIVER: But **we** have been gone sometimes as long as six weeks. Now, were they not good times too?
PWD: They were good times (laugh) but **we** do have to get back, **we** do have arrangements with the animals that **we** have and they miss **us**.

2: Separateness words and phrases

PWD: So do **you** tell him that?
CAREGIVER: No but he picks up on that from **you.** Because **you** complain about **my** spending habits to almost anyone who will listen.

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[1] Verbatim excerpts from conversations between PWDs and their caregivers participating in a daylong study at the Berkeley Psychophysiology Lab.

PWD: Okay and that is why **I** asked **you** if **you** would talk to **me** about it. **You and I** have to talk about it.
CAREGIVER: **I** will try to do that more. But **I** cannot promise **I** will ask -- or **I** might ask **you** and if **I** do not like **your** answer because **I** think **your** answer will be an automatic "no, do not buy that" **I** might sometimes choose to go ahead and buy it.
PWD: Well okay **you** are not going to like this but **you** -- my feeling is that **you** feel **you** have **your** money coming in and **my** money is both of **ours**.
CAREGIVER: Ah. There is some truth to that.
PWD: **I** would like to feel completely opposite. They are all both of **our** money. If not then **you** have **your** money and **I** have **mine**.

In the first conversation, which was characterized by a high ratio of we-words and low separateness words and phrases by both PWD and caregiver, both partners are warm and there is a sense of togetherness (e.g., PWD assures the caregiver, "You take us on many travels" and "That is very, very good."; caregiver asks clarifying questions to understand the PWD's perspective: "Were those not good times too?", "And we do not disagree on that?"). The second conversation, which was characterized by a high ratio of *you* and *I*-words and *"you and I"*-phrases provides a stark contrast. The caregiver appears more irate and critical than warm (e.g., "Because you complain about my spending habits to almost anyone who will listen."), while the PWD appears more frustrated (e.g., "Okay and that is why I asked you if you would talk to me about it. You and I have to talk about it.") and their use of language, specifically the use of more *you* and *I* words and *"you and I"*-phrases, feels distancing. These conversations exemplify how pronoun usage by PWDs and caregivers manifest themselves during an interaction. Hence, understanding and characterizing such PWD-caregiver interactions by pronoun usage is important to furthering our understanding of how pronoun usage function in a PWD-caregiving context, and how they impact caregiver mental health.

Caregiver Mental Health After Caregiving

While it is clear that caring for a spouse with dementia has deleterious effects on the caregiver, research suggests that caregivers' mental health may actually improve after the death of the PWD. Despite the death of a loved one being a major source of stress; 72% of familial caregivers of PWDs judged the death of the PWD as a relief (Schulz et al., 2003). Although familial caregivers of PWDs exhibit high levels of depression during the caregiving period, Schulz found that they are remarkably resilient with many reporting clinically significant declines in depressive symptoms 3 months after the death of the PWD, with even lower levels reported a year later. Still, in a one year post-death follow-up study, 30% of familial caregivers demonstrated clinical levels of depression and 20% experienced complicated grief, defined as prolonged and intense yearning for someone who has died (Schulz et al, 2005). As such, it is important to gain a better understanding of the factors associated with caregivers' vulnerability and resiliency to negative outcomes after the PWD has died. A review of this literature reveals a number of pre-loss factors which have been implicated in caregivers' vulnerability for experiencing complicated grief and depression post-death including higher caregiver depression levels, more caregiver burden, and more impaired cognitive functioning in the PWD (Schulz et al, 2005). Additionally, Sanders et al, (2007) found that caregivers who reported more yearning for the past, regret and guilt, and isolation post-death had more complicated grief.

Pronouns as predictors of caregivers' mental health post-death. Although no research thus far has linked pre-loss pronoun usage with caregiver outcomes, the literature suggests that there may be a relationship. Caregiving spouses, in particular, are more likely to state that the loss of a partner who was a main source of socialization, emotional support, and well-being was especially detrimental to their well-being. Given that caregivers who perceive a loss in social support post-death have more depressive symptoms, it's important to consider the impact of the pre-loss interpersonal relationship between PWDs and their caregiving spouses on caregivers' mental health post-death. A review by Lobb et al, (2010) suggests that close, supportive, and confiding marriages can be especially predictive of complicated grief. Additionally, it is important to note that caregivers who reported more positive aspects of caregiving were more likely to suffer from complicated grief and depression post-death (Schulz et al, 2003). Taken together, these findings highlight how a close relationship with a spouse who has dementia can impact a caregiver's ability to "bounce back" after the spouse has died. Examining pre-loss pronoun usage by PWDs and their caregivers, which has been linked with marital closeness, may help identify which caregivers are more vulnerable to experiencing negative mental health outcomes after the passing of the PWD.

The Present Study

Based on the existing literature, it is clear that pronoun usage is a powerful tool for studying individuals and the nature of relationships, yet there are still some gaps in our understanding of their role in more vulnerable and at-risk populations. To extend this line of research, I propose to examine pronoun usage in PWDs and their spousal caregivers, the latter being a highly vulnerable population at high risk for feeling disconnected and isolated from others. First, I will examine differences in pronoun usage between two dementia types: bvFTD and AD, and healthy controls. A review of the literature suggests that pronoun usage in PWDs may fluctuate as a function of disease type because socio-emotional functioning is typically preserved in AD patients, while bvFTD patient often have breakdowns in socio-emotional functioning that lead to greater withdrawal from their social worlds and less connection to others. In the words of one caregiver attempting to articulate her grief and feelings of loss, "It's like a funeral that never ends."

To understand how this loss affects caregivers, it is important to also examine how pronoun usage by both PWDs and caregivers is related with caregivers' mental health. Previous studies (Connelly, et al; under review) have suggested a link between the types of pronouns PWDs and caregivers use and negative caregiver outcomes, but the samples were underpowered and the investigators did not differentiate between the use of we-words and *"you and I"*-phrases when referring to the couple. To fill this void, I propose to separate the use of we-words and *"you and I"*-phrases, and to employ a much larger sample size. Additionally, because previous research suggests that pronoun use may reflect where individuals focus their attention, I will examine you-words and I-words separately rather than combining them into a "separateness" construct.

Finally, previous research has suggested that a close pre-loss relationship to the PWD can lead to worse caregiver outcomes post-death, but few studies have examined specific language indicators of the quality of relationship like pronoun usage. Further, no studies to date have measured pre-loss pronoun usage in an attempt to predict caregivers' mental health after the PWD has died. To fill this gap, I will conduct post-death mental health assessments of caregivers to examine the role of pronoun usage by PWDs and their spousal caregivers in predicting caregivers' mental health post-death many years later.

Methods

Participants

Data were utilized from research conducted at the Berkeley Psychophysiology Laboratory that examined the emotional functioning of 311 dyads (254 PWD-caregiver dyads and 57 healthy aged controls) across three studies conducted between the years 2002-2018. Study 1 was conducted between 2002-2006, and primarily focused on the assessment of the emotional functioning of PWDs. Spousal caregivers participated only in the conflict conversation (described below) and did not complete any self-report measures. Study 2 was conducted between 2007-2012, and included the same procedures as Study 1 with the addition of having caregivers complete questionnaires measuring caregiver mental and physical health. Study 3 was conducted between 2013-2018, and expanded on the same procedures in Study 2 to include a more thorough assessment of caregivers' emotional functioning and health outcomes. Finally, caregivers of PWDs who had died since their lab session were contacted for a follow-up study examining their current well-being.

PWDs and their caregivers were recruited at the University of San Francisco, Memory and Aging Center (MAC) where they underwent standard neurological and neuropsychological assessments. Healthy controls were recruited by the MAC using local newspaper advertisements and were screened to ensure no prior history of neurologic, psychiatric or cognitive disturbances. Combined across all studies, PWDs and caregivers typically ranged between 50-80 years old (PWD *M*=65.66, SD=8.21; Caregiver=62.49, SD=8.45) while controls typically ranged from 40-80 years old (*M*=63.71, SD=13.18). In terms of ethnicity of patients, 91.2% were Caucasian American, 2.6% Asian American, and 3.2% Hispanic/Latino. Among caregivers, 89.3% were Caucasian American, 3.9% Asian American, 2.1% Hispanic/Latino. In terms of ethnicity of control patients, 94.2% were Caucasian Americans, 2.8% Asian American, and 1.1% Hispanic/Latino.

Diagnostic differences in pronoun usage by PWDs and caregivers and healthy controls were examined in a subset of data collected from 196 AD (*N*=75) and bvFTD (*N*=64) patient-caregiver dyads and healthy controls (*N*=57) across all 3 studies. PWDs were diagnosed based on a comprehensive assessment conducted at the MAC which included a clinical interview, neurological and neuropsychological testing, with neuroimaging data collected from structural MRI scans. For PWDs to meet the diagnostic criteria for bvFTD they had to display three of the six potential behavioral or cognitive symptoms (i.e. behavioral disinhibition, apathy, loss of sympathy, hyperorality, stereotyped behaviors, and executive dysfunction with spared memory and visuospatial abilities; (Neary et al., 1998; Rascovsky et al., 2011). To meet the diagnostic criteria for Alzheimer's Disease, PWDs had to display significant memory and cognitive impairments (McKhann et al., 1984).

To examine associations between pronoun use and caregiver mental health at the time of caregiving, we included data from all PWD-caregiver dyads (*N*=204; 49 AD, 64 bvFTD, 20 svPPA, 35 nfvPPA, 36 Other, which included MCI, Parkinson's, and ALS dyads), who participated in the lab session for studies 2 and 3. To examine pronoun use and caregiver mental health post death, data were included for PWD-caregiver dyads from all 3 studies in which the PWD was deceased, and whose caregiver completed a follow-up survey (*N*=25, 11 AD, 5 bvFTD, 2 nfvPPA, 6 Other, which included Parkinson's and ALS).

Procedure

Laboratory session. PWDs and their caregiving spouses came to the Berkeley Psychophysiology Laboratory for a day-long laboratory assessment of emotional and social functioning. Upon arrival, participants were informed that they would be participating in a study of emotion and that their physiological, behavioral, and self-reported responses would be recorded and videotaped. Prior to the start of the laboratory session, participants had physiological sensors attached (these data were not used for the present study). Throughout the session, participants' upper body and face were filmed with a partially concealed video camera. At the end of the experiment, participants provided consent for varying levels of usage of the video recording (e.g., research only, public showings). The experimental protocol included a number of laboratory tasks that were designed to measure different aspects of emotional and empathic functioning. For the present study, we will focus on a task where the couples participated in a well-established procedure for studying marital interaction (Levenson, Carstensen, & Gottman, 1994; Levenson & Gottman, 1983). During this task, couples were shown to a comfortable room and seated opposite one another with two video cameras unobtrusively placed overhead. Couples were introduced to the task by an experimenter who described the procedure, answered questions, and explained that the video would be used for research investigating how couples handle disagreements in their relationship. Couples then discussed a chosen continuing disagreement in their marriage (i.e., conflict conversation) for ten minutes after a five-minute baseline period. Conversations were recorded on videotape for subsequent transcription and analysis and a number of physiological measures were recorded continuously from each spouse. For the present study, only the transcription data obtained during the conflict conversation will be used. A week prior to their laboratory sessions, caregivers from studies 2 and 3 only completed a questionnaire packet that included measures of mental health.

Caregiver follow-up. PWDs typically complete annual follow-ups at the MAC to monitor their disease severity and receive updated treatment plans. If PWDs were unable to return in person, updates were provided over the telephone and recorded in their file. To identify caregivers who are no longer serving in the caregiving role, the MAC compiled a list of PWDs who died (N=249). However, since caregiver information from Study 1 was not collected, we only had contact information for 138 caregivers. Identified caregivers were contacted over the phone and asked if they could participate in a brief follow-up survey. Upon providing consent, a survey was then emailed to the caregiver. Out of the 138 caregivers who were contacted, 45 completed the follow-up survey, 30 of whom participated in the conflict conversation during their lab visit. Five additional caregivers were then excluded from the final dataset for not providing complete data. As a result, 25 caregivers were included in the final analysis for Aim 3. Caregivers were predominantly female (84%), and ranged from 59-95 years old (*M*=70.48, *SD*=8.33). The range of time between the death of the PWD and completion of the follow-up survey ranged from 2-13 years (*M*=6.25, *SD*=2.88).

Apparatus

Audiovisual. Remotely-controlled high-resolution color video cameras placed behind darkened glass in bookshelves recorded participants' facial behavior and upper body movement. Microphones recorded their voices. Two archival copies of the recording were made using a DVD recorder and a second copy was stored in digital form on our laboratory video server for subsequent coding.

Measures

Transcription of conversations. Verbatim transcripts of each couple's conflict conversation were created and prepared for text analysis. The transcript represented as close to an exact reproduction of the couple's conversation as possible. All words spoken as whole words were reproduced in standard English spelling. The transcripts were clearly structured by identifiers indicating turns of speech.

Text Analysis. Text analytic procedures and methods have provided useful in the domain of interpersonal relationships (Buehlman, Gottman, & Katz, 1992; Agnew, Van Lange, Rusbult, & Langston, 1998; Fitzsimons, & Kay, 2004; Seider, Hirschberger, Nelson, & Levenson, 2009). One advantage of text analytic approaches is that they do not rely on observer, subject, or expert report. Instead they are based on verbal protocols and lexicons, thereby reducing problems of reliability and low intercorrelations among coders.

Oedipus Text. The text-analytic approach employed in this study utilizes the text analysis program, Oedipus Text, developed by Robert Levenson (1990). Previous versions of the program used the single word as the unit analysis; however, the most recent version of the program can identify specific phrases as well. Oedipus Text prioritize phrases over individual words so that individual words do not get counted twice if they are part of a phrase. For example, Oedipus Text will prioritize the phrase "you and me" over the word "you".

Pronoun use: Oedipus Text was used to count the total number of pronouns in each of four lexical categories as indicated by a dictionary file: (a) *I*-words; (b) *You*-words; (c) *We*-words; and (d) *"You and I"*-phrases. The complete dictionary is as follows:

I-Words

- I
- I'D
- I'LL
- I'M
- I'VE
- ME
- MINE
- MY
- MYSELF

You-Words

- YOU
- YOU'D
- YOU'LL
- YOU'RE
- YOU'VE
- YOUR
- YOURS
- YOURSELF

We-Words

- OUR
- OURS
- OURSELVES
- US
- WE
- WE'D
- WE'LL
- WE'RE
- WE'VE

"You and I"-Phrases

- I AND YOU
- ME AND YOU
- MINE AND YOURS
- MYSELF AND YOURSELF
- YOU AND I
- YOU AND ME
- YOURS AND MINE
- YOURSELF AND MYSELF

Context Coding. Most studies that employ text analysis procedures utilize software programs that are designed to automatically detect and quantify the occurrence of individual pronouns (e.g., *I*, *you*, *we*) within each transcript for each speaker. These approaches do not consider the context in which the pronoun is spoken. Rather, it is a purely automatic procedure that solely depends on the total occurrences of each pronoun. Although this form of text analysis achieves independence from observer ratings, it calls into question the validity of the concepts being measured (i.e., *we*-ness vs separateness). For example, a partner might say, "Our unemployment levels are very low." The use of "our" in this case actually refers to "Americans" rather than the couple. Because we wanted to ensure that each use of pronoun refers to the individual spouses or couple, additional context analysis was conducted using the Oedipus Text program.

Oedipus Text was designed to allow for an interactive approach between a trained coder and the program. The coder serves as an informant who decides how each pronoun selected by the pronoun dictionary should be categorized. For each pronoun and category assignment, the program pauses, displays each pronoun to be coded in the sentence which it occurs along with the previous and following sentences to provide further context for the pronoun. The program presents the coder with a variety of category assignments and the coder determines the final category selection for each pronoun considered. For the present study, coders categorized each of the pronouns into one of 9 categories: (a) *I*-words; (b) *You*-words; (c) *We*-words; (d) *"You and I"*-phrases; (e) dysfluencies, which occurs when there is a repetition and/or the truncation of a proposition (e.g., "I, I…I need to stop at the store on the way home."; in this example, the first 2 utterances of "I" would be coded as dysfluencies, and the third utterance would receive an "I" code); (f) fillers, which are used by speakers to fill gaps in their narrative but serve no communicative function (e.g., you know, I mean); (g) generics, which occurs when the speaker uses pronouns generically, rather than referring to an actual person (e.g., "We are all creatures of God"); (h) references to others, which occurs when the speaker is referring to or speaking for another person (e.g., "After work, we went to happy hour to celebrate her last day."); and (i) elder speak, which is a form of baby talk often directed at older adults in care (e.g., "Did we forget to take our medicine today?"). The context coding resulted in dropping 12.4% of the pronouns from PWDs' transcriptions and 11.6 % of the pronouns from caregivers' transcriptions.

PWD Problem Behaviors (covariate). Caregivers completed the Neuropsychiatric Inventory (NPI; Cummings, et al., 1994), which is an informant-report measure that assesses PWD behavioral disturbances in multiple socio-emotional domains (i.e., hallucinations, delusions, agitation/aggression, dysphoria/depression, anxiety, irritability, disinhibition, euphoria, apathy, aberrant motor behavior, sleep disturbances, and eating disorders). Frequency (1 = occasionally, less than once per week, to 4 = very frequently, once or more per day or continuously) and severity (1 = mild, to 3 = severe) ratings were provided by caregivers. Total scores for each domain were calculated by taking the product of frequency rating and severity rating for each domain. A total behavioral disturbances score was calculated by summing scores across all 12 domains (scores range from 0-120), with higher scores indicating more behavioral impairment.

Clinical Dementia Rating Scale. Patients' dementia severity was assessed using the Clinical Dementia Rating Scale Sum of Boxes (CDR; Morris, 1993). The CDR is a clinician-rated scale designed to assess areas of functioning in multiple domains including memory, judgment, orientation, community affairs, home and hobbies, and personal care on a 5-point scale of impairment (0=no impairment, 0.5=questionable impairment, 1=mild impairment, 2=moderate impairment, 3-severe impairment). Possible scores range from 0-18, with higher scores indicating greater functional impairment.

Caregiver Mental Health Measures at Lab Session: As previously noted, only caregivers from studies 2 & 3 completed outcome measures. Additionally, caregivers from studies 2 completed the SCL-90 (Derogatis & Savitz, 2000) subscales to assess both depression symptomatology and anxiety, and caregivers from study 3 completed the Center for Epidemiological Studies-Revised (CES-D-R; Eaton, Smith, Ybarra, Muntaner, & Tien, 2004) to measure depressive symptomatology, and the Beck Anxiety Inventory to measure of anxiety (Beck, Epstein, Brown, & Steer, 1988) (refer to sections below for full description of measure). As the focus of research adjusted to include more assessment of caregiver well-being, measures of anxiety and depression were changed in study 3 to be more consistent with current caregiving literatures. As a result, the following measures of anxiety and depression needed to be converted to a common metric (described in detail in Data Reduction section).

Caregiver Depression:

Study 2. Caregivers completed the Symptom Checklist-90-R (Derogatis & Savitz, 2000), a well-validated brief self-report measure designed to evaluate a broad range of psychological problems and symptoms of psychopathology. This study utilizes the sum of 13 items from the depression subscale, a sample item of which is "Feeling hopeless about the future." Each item is rated on a scale of "not at all" (0) to "extremely" (4). Items belonging to the depression subscale are averaged to create a depression score, with higher scores representing higher levels of depression. The SCL-90-R depression subscale has demonstrated reliability, validity, and clinical utility in previous studies (Schmitz et al, 2000).

Study 3. Caregivers' levels of depressive symptoms were assessed using the Center for Epidemiological Studies Revised (CES-D-R; Eaton, Smith, Ybarra, Muntaner, & Tien, 2004), a 20-item questionnaire. For each item, caregivers will rate themselves on a four-point scale from 0 (not at all) to 3 (a lot). Examples of items are "I was bothered by things that don't usually bother me" and "I enjoyed life (reversed)." Items are summed (possible scores range from 0-60) with higher scores indicating more depressive symptoms. The CES-D has demonstrated reliability and validity across general and clinical populations (Lewisohn et al, 1997; Van Dam & Earlywine, 2011).

Caregiver Anxiety:

Study 2. Caregivers completed the Symptom Checklist-90-R (Derogatis & Savitz, 2000), which included a 10-item anxiety subscale which was used for this study. Each item is rated on a scale of "not at all" (0) to "extremely" (4). Sample items are "Nervousness or shakiness inside" and "Trouble concentrating." Items belonging to the anxiety subscale are averaged to create an anxiety score, with higher scores representing higher levels of anxiety. The SCL-90-R anxiety subscale has demonstrated reliability, validity, and clinical utility in identifying individuals with clinical levels of anxiety (Schmitz et al, 2000).

Study 3. Caregivers completed the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988), a 21-item measure which assesses cognitive and somatic symptoms of anxiety. For each item, caregivers rate themselves on a four-point scale from 0 (not at all) to 3 (severely). Items include multiple symptoms of anxiety (e.g. heart pounding, difficulty breathing, fear of the worst). Items are summed (possible scores range from 0-63) with higher scores indicating more depressive symptoms. Research supports the reliability and validity of the BAI as a measure of anxiety (Fydrich, Dowdall, & Chambless, 1992; Osman et al, 1997).

Caregiver Mental Health Measures at Follow-up. Caregivers of deceased PWDs from all 3 studies were contacted for a follow-up and completed the CES-D-R and BAI (described above).

Data reduction

Pronoun ratio scores. Because we were interested in the proportion of each pronoun type used relative to all pronouns spoken, each PWD and caregiver received a percentage score for each lexical category (*I*-words, *you*-words, *we*-words, *"you and I"*-phrases) by dividing the total number of words in each category by total number of pronouns spoken by that speaker.

Converting different measures of depression and anxiety to a common metric. Because caregivers from studies 2 and 3 completed different measures for both depression and anxiety, it was necessary to convert scores to a common metric. Previous research has linked common metrics by collecting responses for both metrics from a demographically similar sample, identifying the slope and intercept between measures in that sample, and then using simple regression equations to predict scores from one measure to another (Hawley, et al 2013; Heo, Murphy & Meyers, 2007). Hawley, et al (2013) note that this method has estimated scores from one measure to another with accuracy. To accomplish this in the present study, a sample of 255 participants in the typical age range for our caregivers (i.e., ages 50-80) was recruited using Mturk. Participants completed both the SCL-90 and BAI measures of anxiety and the SCL-90 and CES-D measures of depression. Twenty-four participants were excluded (13 for failing the attention check in which they were instructed to select a specific response, 11 for incomplete data) which resulted in a final sample size of 231. In terms of age, Mturk participants ranged from 46-78 years old (*M*=59.03, *SD*=7.82) and the majority identified as female (58.1%). In terms of race, the Mturk participants mirrored our lab sample with 87.6% participants identifying as white, 4.3% identifying as black, 1.3% Asian, .4% Other. In terms of marital status, 40.6% Married, 23.9% Divorced, 20.5% Never Married, 6.8% Widowed, and 1.7% Never Married. Reliability for the BAI (alpha = .924) and SCL-90-R anxiety subscale (alpha = .912) were high. Internal reliability for the CES-D-R (alpha = .733) and SCL-90-R depression subscale (alpha=.937) were also high.

The Mturk data were then used to convert anxiety and depression scores from the SCL-90 to BAI and CES-D scores. To accomplish this, the linear model function in the statistical software program R was used to obtain the slope and intercept of each prediction model (SCL-90 anxiety subscale scores predicting BAI scores, and SCL-90 depression subscale scores predicting CES-D scores), which was then used to calculate the predicted y-values for the Study 2 dataset the metric used in Study 3. Participants predicted y-values were then used in subsequent analyses involving data collected at the time of caregiving. Previous literature has indicated high concurrent validity between the CES-D and SCL-90 depression subscale with correlations ranging from .73 to .89 among patients with depression (Faulstich, 1986). The association between CES-D and SCL-90 depression scores in the MTurk study was high (*r*=.918, *p*=.000). Additionally, previous work has demonstrated high concurrent validity between the BAI and SCL-90 anxiety subscale (*r*=.81) within psychiatric outpatient populations (Steer, Ranieri, Beck, & Clark, 1993). The association between the BAI and SCL-90 anxiety subscale scores in the MTurk study was also high (*r*=.852, *p*=.000).

Next, to provide support for this method, an item analysis on similar items between the SCL-90 depression subscale and the CES-D, and the SCL-90 anxiety subscale and the BAI, was conducted to test the content validity across measures. To accomplish this, the content of the items on the SCL-90 anxiety and depression subscales were compared to the content items on the CES-D and BAI and then matched. In some instances, multiple items on the scales were classified as matching the same criterion-based symptom. For example, "trembling" on the SCL-90R was matched with two separate items on the BAI (i.e., “hands trembling”, “shaky and/or unsteady”). Bivariate correlations revealed significant coefficients for all matched items on the anxiety measures that ranged from .496 to .855, and .565 to .945 for all matched items on the depression measures suggesting good validity across matched items. The content of some items of each measure could not be matched with an item from the corresponding scale (7 of 13 items from the SCL-90-R depression subscale and 12 of 20 from the CES-D; and, 2 of 10 items from the SCL-90-R anxiety subscale and 13 of 21 items from the BAI). However, many of the symptoms ultimately not matched are widely accepted as typical manifestations of anxiety (e.g., “feeling faint or light-headed”, “numbness and tingling”) and depression (e.g., “feeling no interest in things” and “poor appetite”). See Tables 4, 5, and 6.

Lastly, to assess the concurrent validity of the final composite caregiver mental health measure, correlations were conducted to examine the pattern of the measure’s relationship with established covariates of negative caregiver outcomes (i.e., patient problem behaviors, dementia severity, gender of caregiver; Pinquart & Sorenson, 2003; Schulz et al, 1995). Consistent with previous literature, correlations revealed that worse caregiver mental health (using the composite measure) was significantly associated with more patient problem behaviors (r=.267, P=.000), greater dementia severity (*r*=.172, *p*=.024), and caregiver gender (worse for female caregivers, (*r*=.247, *p*=.001). These results provide further support for the validity of this method of transforming scores from different measures to a common metric.

Caregiver Mental Health Composite Scores. Depression and anxiety scores in the post-death follow up were highly correlated *(r*= .849. Additionally, the correlation between the CES-D and BAI scores (with predicted CES-D and BAI scores substituted for Study 2 participants) measured at the time of the lab session was moderately high *(r*=.616). Therefore, two mental health composite scores were calculated, one for the scores collected at the time of caregiving and one for the scores collected in the post-death follow-up, by averaging the z-scores of the BAI and CES-D collected at each timepoint. These composite scores will be included in all subsequent analyses.

Hypotheses

The present study had three primary aims: (1) to determine whether there are diagnostic differences in the use of personal pronouns in PWDs and their caregivers, (2) to determine whether personal pronoun use by PWDs and their caregivers are associated with caregivers' mental health at the time of caregiving, and (3) to determine whether personal pronoun usage by PWDs and their caregivers are associated with caregivers' mental health post-death after controlling for their pre-death levels of depression.

Aim 1: To identify whether there are diagnostic differences (bvFTD vs AD) in the use of personal pronouns in PWDs and their caregivers.

Hypothesis 1a: PWDs with bvFTD will use higher ratios of *I*-words and *"you and I"*-phrases and lower ratios of *we*-words and *you*-words than PWDs with AD and healthy controls.
Hypothesis 1b: Caregivers of PWDs with bvFTD will use higher ratios of *you*-words and *"you and I"*-phrases and lower ratios of *we*-words and *I*-words than caregivers of PWDs with AD and healthy controls.

Rationale: Loss of social awareness, including withdrawal from their social world and declines in emotional connection from their spouse, are more common in behavioral variant frontotemporal dementia than other dementias such as Alzheimer's disease. Given the literature suggesting certain pronoun types signal separateness in relationships, we expect that PWDs with an FTD diagnosis will use a greater ratio of *I*-words and "*you and I"*-phrases and lower ratio of *you*-words and *we*-words than PWDs with an AD diagnosis or healthy controls. Additionally, because research suggests a decline in emotional connection between PWDs with bvFTD and their caregivers, and PWDs with bvFTD often withdraw from their social world which may lead some caregivers feeling isolated, we expect that caregivers of PWDs with a bvFTD diagnosis will use a greater ratio of *you*-words and *"you and I"*-phrases and a lower ratio of *I*-words and *we*-words than caregivers of PWDs with AD or healthy controls.

Aim 2: To determine whether personal pronoun use by PWDs and their caregivers are associated with caregivers' mental health at the time of caregiving.

Hypothesis 2a: Greater use of *I*-words and *"you and I"*-phrases and lower use of *we*-words and *you*-words by PWDs will be associated with worse caregiver mental health at the time of caregiving.
Hypothesis 2b: Greater use of *you*-words and *"you and I"*-phrases and lower use of *we*-words and *I*-words by caregivers will be associated with worse mental health at the time of caregiving.

Rationale: Research shows that the use of "we"-words is associated with a stronger connection to others, and that more closeness in a relationship can serve as a protective factor for caregivers' mental health, I expect that lower use of "we"-words by PWDs and caregivers will be associated with worse caregiver mental health. Further, because *I*-words have been linked with greater self-focus and spousal caregivers of dementia PWDs are especially at risk for feeling isolated, I expect that greater use of pronouns that exclude the caregiver (patient-*I,* caregiver-*you*) will be associated with worse caregiver mental health, and greater use of pronouns that include the caregiver (patient-*you*, caregiver-*I*) will be associated with better caregiver mental health at the time of caregiving. Lastly, given that research suggests a decline in emotional connection between PWDs and their caregivers may adversely affect caregivers' mental health, I expect that greater use of *"you and I"*-phrases, where both PWDs and caregivers refer to the partners in the couple as individual entities, will be associated with worse caregiver mental health.

Aim 3: To determine whether personal pronoun usage by PWDs and their caregivers are associated with caregivers' mental health post-death.

Hypothesis 3a: Greater use of *we*-words and *you*-words and lower use of *I*-words and *"you and I"*-phrases by PWDs will be associated with worse caregiver mental health during the post-caregiving recovery period.

Hypothesis 3b: Greater use of *we*-words and *I*-words and lower use of *you*-words and *"you and I"*-phrases by caregivers will be associated with worse caregiver mental health during the post-caregiving recovery period.

Rationale: Given that pronoun usage may be an indicator of the quality of relationship prior to the PWD's death and that research suggests that spouses suffer from more complicated grief and yearn more for their partner when they had a less conflicted relationship, I expect that greater use of *we*-words and *you*-words and lower use *I*-words by PWDs will be associated with worse caregiver mental health post-death. Further, I predict that greater use of *we*-words and *I*-words and lower use of *you*-words by caregivers will be associated with worse caregiver mental health post-death. Lastly, given that research suggests a decline in emotional connection between PWDs and their caregivers has an adverse effect on caregivers' mental health at the time of caregiving, I expect that greater use of *"you and I"*-phrases, where both PWDs and caregivers refer to the partners in the couple as individual entities, will be associated with better caregiver mental health post-death.

Results

Demographic and clinical variables

In terms of gender, 62.5% of caregivers identified as female. The distribution of male and female caregivers among diagnostic groups (bvFTD, AD, health controls) was compared using a chi-square test. Results indicated that groups did not differ in gender, ($\chi 2$ (2, *N*=193) =2.62, *p* =.269). Age differences between caregivers among diagnostic groups were examined using analysis of variance (ANOVA). Results indicated that caregivers did not differ in age across groups, (*F* (2,130) = 3.402, *p* = .036).

ANOVAs were also used to examine diagnostic differences in patient problem behaviors, as assessed by the NPI total score, and dementia severity, as assessed by the CDR box score. Results revealed significant group differences in patient problem behaviors *(F*(2, 151) = 30.7, *p* = .000). A Bonferroni post hoc test revealed that bvFTD (*M*=45.05, *SD*=21.30) patients scored significantly higher than AD (*M*=18.23, *SD*=18.42; *Cohen's d*=1.35) and healthy controls (*M*=20.78, *SD*=4.83; *p*=.000; *Cohen's d*=1.57). No differences in patient problem behaviors were found between AD patients and healthy controls (*p*=.860). See Figure 1.

Results presented in Figure 2 reveal significant group differences in dementia severity, *F*(2,

191) = 62.81, *p* = .000. A Bonferroni post hoc test revealed both AD (*M*=4.47, *SD*=2.10; *Cohen's d*=1.63) and bvFTD (*M*=6.16, *SD*=3.35; *Cohen's d*=1.84) patients demonstrated significantly greater dementia severity than healthy controls (*M*= .89, *SD*=2.28; *p*=.000), and that bvFTD patients demonstrated significantly greater dementia severity than AD patients (*p* = .001; *Cohen's d*=.61). For Aims 2 and 3, results of regression analyses with and without patient problem behaviors and dementia severity entered as covariates will be presented. Descriptive statistics for demographic and clinical variables are presented in Table 2.

While the present study intended to examine the use of *"you and I"*-phrases, there were few occurrences of *"you and I"*-phrases spoken during the interactions, with only 40 of the 508 total participants (32 caregivers, 8 PWDs) uttering 1-3 total *"you and I"*-phrases each. T-tests revealed no significant differences in study outcomes between dyads who used and did not use *"you and I"*-phrases. Thus, *"you and I"*-phrases were not included in subsequent analyses.

Aim 1: To identify whether there are diagnostic differences (bvFTD vs AD vs health controls) in the use of personal pronouns in PWDs, caregivers and healthy controls.

Analytic Approach: To examine whether there are diagnostic differences in the use of personal pronouns in PWDs, their caregivers, and healthy controls, a series of three 3x3 ANOVAs were performed with diagnosis type (bvFTD, AD, healthy control) and partner type (PWD, caregiver, health partner) as between-subjects factors and pronoun type ratio scores (*I*-words, *you*-words, *we*-words) as the dependent variable for each model.

In terms of the use of *I*-words, results revealed a significant interaction between diagnostic group and partner type, *F*(1, 385) = 37.14, p=.000, with PWDs in the bvFTD group using a higher proportion of I-words (*M*=.69, *SD*=.16) than participants in all other group and caregivers of PWDs with bvFTD (*M*=.34, *SD*=.13) using a lower proportion of I-words than participants in all other groups. In terms of the use of *you*-words, results revealed a significant interaction between diagnostic group and partner type, *F*(1, 385) = 150.87, p=.000, with caregivers in the bvFTD group using a higher proportion of you-words (*M*=.49, *SD*=.15) than participants in all other group and PWDs with bvFTD using a lower proportion of you-words (*M*=.19, *SD*=.12) than participants in all other groups. In terms of the use of *we*-words, results revealed a marginally significant interaction between diagnostic group and partner type, *F*(1, 385) = 2.95, p=.087, with patients in the AD group using a higher proportion of we-words (*M*=.176, *SD*=.15) than participants in all other group and PWDs with bvFTD using a lower proportion of we-words (*M*=.125, *SD*=.12) than participants in all other groups. Thus, the hypothesis that there would be diagnostic differences across partner type in the use of personal pronouns was partially supported.

Aim 2: To determine whether personal pronoun use by PWDs and their caregivers are associated with caregivers' mental health at the time of caregiving above and beyond dementia severity.

Analytic Approach: Missing data occurred for some participants. Of the 204 PWD-caregiver dyads, 28 were excluded because of missing mental health outcomes data due to procedural errors. Additionally, three outliers for the mental health composite, with z-values above 3, were removed prior to the analysis. All analyses were completed using the maximum number of available cases.

Descriptive statistics for demographic and clinical variables are presented in Table 3.[2]

As a result, the analyses for Aim 2 utilized a sample of 173 patient-caregiver dyads. In our analyses, we tested (1) whether personal pronoun use by PWDs was associated with caregivers' mental health at the time of caregiving and (2) whether personal pronoun use by caregivers was associated with caregivers' mental health at the time of caregiving. First, a series of bivariate correlations were conducted to examine the relationship between all 6 predictor variables and caregiver mental health at the time of caregiving. Additionally, the association between potential covariates (patient problem behaviors, dementia severity, caregiver gender and age). and caregiver mental health at the time of caregiving were examined.

Following the correlation analyses, hierarchical linear regressions were performed to examine the association between the 6 pronoun types and caregiver mental health at the time of caregiving. Because pronoun scores in each category were computed as the proportion of total scores, they are not statistically independent. Thus, to avoid problems with collinearity, the data used to test the hypotheses were analyzed initially using six (three pronoun categories X two participants) hierarchical linear regressions with identified covariates entered in step 1 and caregiver mental health at the time of caregiving as the dependent measure for the hypothesis. If these associations were significant, analyses were conducted to identify which pronoun type was most predictive of caregiver mental health at the time of caregiving using a hierarchical linear regression.

Lastly, because diagnostic differences in the types of pronouns used were established, exploratory analyses were conducted to determine whether the type of patient impairment moderates the relationship between pronoun use and caregiver mental health. Thus, participants, based on their diagnosis (bvFTD, AD, svPPA, nfvPPA, MCI, Parkinson's, and ALS), were collapsed into one of four groups based on type of impairment (38 Emotion, 55 Cognitive, 53 Language, and 27 Motor). Using the Motor group as a reference, 3 categorical variables were created for each category of impairment (Emotion [0 = no, 1 = yes], Cognitive [0 = no, 1 = yes], Language [0 = no, 1 = yes]. Next, interaction terms between the pronoun variable and each of the dummy coded impairment categories were created. Finally, 6 hierarchical linear regressions were performed (one for each pronoun type) with each of the 3 dummy coded variables, the pronoun type score, and 3 interaction terms entered as predictors and caregiver mental health entered as the dependent variable.

Bivariate correlations. Correlations revealed that PWD and caregivers' use of I-words, you-words, and we-words were not associated with caregiver mental health at the time of caregiving. Results showed that higher patient problem behavior (r = .267, p = .000), dementia severity (r = .167, p = .024), and caregiver gender (female caregivers; r = .247, p = .001), were significantly associated with worse caregiver mental health at the time of caregiving. Thus, patient problem behavior, dementia severity, and caregiver gender were entered as covariates. See Tables 7 and 8.

PWD pronoun use and caregiver mental health at the time of caregiving. After controlling for patient problem behavior, dementia severity, and caregiver gender, the regression analyses revealed no significant associations between PWDs' use of I-words (B = .130, SE(B) = .342, β= .030, p = .705), you-words (B = -.278, SE(B) = .42, β= -.051, p = .506), or we-words (B = .134, SE(B) = .522, β= .021, p = .798) and caregiver mental health at the time of caregiving. See Table 9.

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[2] Analyses were conducted that included the three outliers, and findings remained stable.

Caregiver pronoun use and caregiver mental health at the time of caregiving. After controlling for patient problem behavior, dementia severity, and caregiver gender, the regression analyses revealed no significant associations between caregivers' use of I-words (B = .005, SE(B) = .395, β= .001, p = .990), you-words (B = .019, SE(B) = .398, β= .004, p = .962), or we-words (B = -.034, SE(B) = .472, β= -.006, p = .943) and caregiver mental health at the time of caregiving. See Table 10.

Exploratory Analyses. Six regressions were conducted to examine whether type of patient impairment (i.e., emotion, cognitive, language, motor) moderated the relationship between pronoun use (6 types) and caregiver mental health. Results revealed no significant main effect of impairment type, pronoun type, or the interaction between pronoun type and impairment type on caregiver mental health.

The above findings did not support our hypotheses that PWD and caregiver use of I-words, you-words, and we-words would be associated with caregiver mental health at the time of caregiving.[3][4]

Aim 3: To determine whether personal pronoun usage by PWDs and their caregivers are associated with caregivers' mental health post-death above and beyond dementia severity and caregivers' mental health at the time of caregiving.

Analytic Approach: In our analyses, we tested (1) whether personal pronoun use by PWDs was associated with caregivers' mental health post-death and (2) whether personal pronoun use by caregivers was associated with caregivers' mental health post-death. To examine the relationship between PWD and caregiver pronoun use on caregivers' mental health post-death, the analytic procedures for Aim 2 were followed except the dependent variable was changed to caregivers' mental health post-death. Additionally, since pre-loss depression levels have been found to predict negative outcomes post-death, caregivers' mental health at the time of caregiving was explored as a potential covariate.

Bivariate correlations. Results showed no significant associations between PWD and caregiver use of I-words, you-words, and we-words and caregiver mental health post death. Additionally, no significant associations were found for patient problem behaviors, dementia severity, time lapsed since the death of PWD, caregiver gender, and age. Because no significant associations were found between the study variables, further analyses were not warranted. However, caregiver mental health at the time of caregiving was significantly associated with caregiver mental health-post death (r = .464, p = .021) and was included as a covariate in subsequent analyses. See Tables 7 and 8.

PWD pronoun use and caregiver mental health post-death. After controlling for caregiver mental health at the time of caregiver, the regression analyses revealed no significant associations between PWDs' use of I-words (B = -.166, SE(B) = 1.081, β= -.030, p = .879), you-

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[3] Analyses were also conducted without including patient problem behavior and dementia severity in step 1 of the regression, and findings remained stable. Therefore, the results presented are with patient problem behavior and dementia severity in the first step of the regressions, and pronoun type in the second step, as presented in the analysis section.

[4] Analyses were conducted to determine whether the pattern of results would have been similar across the smaller samples using their respective mental health outcome measures. Regression results for each sample were consistent with the findings presented in the analyses section.

words (B = -1.250, *SE*(B) = 1.270, β= -.195, p = .336), or we-words (B = 2.489, *SE*(B) = 1.589, β= .291, p = .132), and caregiver mental health at the time of caregiving. See Table 11.

Caregiver pronoun use and caregiver mental health post-death. After controlling for caregiver mental health at the time of caregiver, the regression analyses revealed no significant associations between caregivers' use of I-words (B = -.704, *SE*(B) = 1.145, β= -.119, p = -.545), you-words (B = .597, *SE*(B) = 1.392, β= .083, p = .672), or we-words (B = .519, *SE*(B) = 1.53, β= .066, p = .737) and caregiver mental health at the time of caregiving. See Table 12.

The above findings did not support our hypotheses that PWD and caregiver use of I-words, you-words, and we-words would be associated with caregiver mental health at the time of caregiving.[5]

Discussion

In the present study, I sought to examine personal pronoun use in the context of naturalistic marital interactions between PWDs and their spousal caregivers, and neurologically healthy controls. The three major aims included better understanding: (a) diagnostic differences in the use of personal pronouns, (2) how personal pronoun use by PWDs and caregivers is associated with caregiver mental health at the time of caregiving, and (3) whether personal pronoun use by PWDs and caregivers at the time of caregiving predicts caregiver mental health after the PWD dies. To accomplish this objective, PWDs and their spousal caregivers as well as neurologically healthy couples, engaged in a ten-minute, unrehearsed, video-taped conversation about a topic of disagreement. Next, verbatim transcripts of the conversations were processed through text analysis software (Oedipus Text; Levenson, 1990) to isolate pronouns that referred to the individual spouses and couple only. Each speaker then received a ratio score for each lexical category (I-words, you-words, we-words, *"you and I"*-phrases) by dividing the total number of words in each category by total number of pronouns spoken by that speaker. *"You and I"*-phrases were removed from subsequent analyses due to insufficient occurrences in the data. Caregiver mental health composite scores were computed by standardizing and then averaging depression and anxiety scores collected at the time of caregiving and post-death.

The first aim examined diagnostic differences in the types of pronouns used and found an interaction effect between diagnostic group (bvFTD, AD, and healthy controls) and partner type (PWD, caregiver, healthy partner) in that PWDs with bvFTD used significantly more I-words than all other groups while caregivers of bvFTD patients used significantly fewer I-words than all other groups. Additionally, PWDs with bvFTD used significantly fewer you-words than all other groups while caregivers of bvFTD patients used significantly more you-words than all other groups. The interaction effect for we-words was marginally significant with PWDs with AD using the most we-words and PWDs with bvFTD using the fewest we-words. The second aim addressed in this study examined whether the types of pronouns used by PWDs and their spousal caregivers were associated with caregiver mental health at the time of caregiving. No significant association with caregiver mental health at the time of caregiving were found for any of the three pronoun types used by PWDs and caregivers. The third aim examined the association between types of pronouns

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[5] Analyses were also conducted to include the amount of time lapsed since death of PWD as a covariate, and findings remained stable. Therefore, the results presented do not include time lapsed since death of PWD.

used by PWDs and their spousal caregivers and caregiver mental health post-death. Hypotheses related to the third aim were not supported. Each of these aims are discussed below.

Differences in Personal Pronoun Use among Diagnostic Groups

The first aim was concerned with differences among diagnostic groups (bvFTD, AD, and healthy controls) and partner type (PWD, caregiver, healthy partner) in types of pronouns used. Consistent with our hypotheses, findings indicated an interaction effect in that PWDs with bvFTD used significantly more I-words than all other groups while caregivers of bvFTD patients used significantly fewer I-words than all other groups. Additionally, findings revealed an interaction effect in that PWDs with bvFTD used significantly fewer you-words than all other groups while caregivers of bvFTD patients used significantly more you-words than all other groups. Lastly, results revealed a marginally significant interaction effect in that PWDs with AD used the significant more we-words while PWDs with bvFTD used significantly fewer we-words than all other groups. Additionally, examining the three diagnoses within each partner type revealed a marginally significant interaction for the use of we-words, with PWDs with AD demonstrating greater use of we-words than all other groups and PWDs with bvFTD demonstrating fewer use of we-words than all other groups.

Overall, findings revealed that pronoun use changes as a function of disease type and partner type, even after controlling for patient problem behaviors and dementia severity. With the exception of one result, which was marginally significant, the findings were consistent with the hypotheses insofar as PWDs with bvFTD demonstrated a pattern of using fewer words that refer to their partner and more words that referred to themselves and caregivers of PWDs with bvFTD demonstrating the opposite pattern. The findings related to use of I-words and you-words are both understandable given prior research findings. Given the brain areas affected by bvFTD (e.g., frontal and temporal lobes, salience network; Levenson & Miller, 2007, Neary et al., 1998) and the unique challenges that result, the increased use of I-words and decreased use of you-words by PWDs with bvFTD may be a result of impairments in the salience network which are related to attentional control and self-regulation. Previous literature has suggested that these impairments can hinder the patient's ability to process personally salient information and to attend to outside stimuli (Levenson, Sturm, & Haase, 2014). As a result, PWDs with bvFTD may become more socially withdrawn and self-focused (Baruglia et al, 2014; Bozeat et al, 2000; Levy et al, 1996a). The increased focus on the self during these interactions may reflect the carving out of others in the PWDs social world, including close family members such as spouses. Additionally, increased use of you-words and decreased use of I-words by bvFTD caregivers provides further support for this explanation as the use of pronouns may be an indication of the patient becoming the primary focus of the couples' relationship, with caregivers finding themselves receding into the background. Indeed, our finding that bvFTD patients exhibit greater neuropsychiatric symptoms and problem behaviors than AD and healthy controls suggests PWDs with bvFTD may require more attention and care.

Using an objective measure of interpersonal language in patients with bvFTD, these findings highlight the deficits that patients with bvFTD have in in social contexts. However, this finding does not generalize across all patients with neurodegenerative disease. For PWDs with AD, the use of I-words and we-words were comparable to neurologically healthy controls. This supports research which has found that patients with AD have largely intact socio-emotional functioning in the early stages of the disease (Bucks & Radford, 2004; Goodkind, Gyurak, McCarthy, Miller, & Levenson, 2010; Lavenu, Pasquier, Lebert, Petit, & Van der Linden, 1999) and often present as warm, socially appropriate people (Sturm et al., 2013).

Pronoun Use and Caregiver Mental Health at the Time of Caregiving

The second aim was concerned with associations between PWD and caregiver pronoun use (i.e., I-words, you-words or we-words) and caregiver mental health at the time of caregiving and post-death. Contrary to my hypotheses, neither caregiver or PWD pronoun use were associated with caregiver mental health at the time of caregiving and post-death. Regarding caregiver mental health measured at the time of caregiving, the non-significant findings contrast with previous research with patient-caregiver dyads that suggests the use of we-pronouns and separateness pronouns are associated with caregiver mental health outcomes (Connelly et al, 2020; Robbins, et al., 2012; Robbins et al., 2013; Karan, Wright, & Robbins; 2016). It is possible that the non-significant results are due to the use of different metrics to measure anxiety and depression in the different studies. Because caregivers from studies 2 and 3 completed different measures for depression and anxiety, it was necessary to convert the measures to a common metric. To accomplish this, a random sample of age-matched MTurk participants completed all 4 mental health outcome measures (i.e., SCL-90 depression and anxiety subscales from study 2; CES-D and BAI from study 3) and the slopes and intercepts from those data were used to transform depression and anxiety scores of study 2 caregivers (SCL-90 depression and anxiety subscales) to the depression and anxiety scores used in study 3 (CES-D and BAI). Despite demonstrating good reliability and validity, this published method of transforming data remains in question. Hawley et al, (2013) noted that although predictive equations work well on average, this method may not always translate at the idiographic level suggesting that some information may get lost in the translation. Additionally, the MTurk study accepted responses from all participants aged 40-80 with no indication of whether participants served in a caregiving role or not, which provided little context for the information collected. It is likely that the responses of the participants in the Mturk study do not accurately reflect the experiences of individuals who provide care for their spouses with dementia.

The finding is also worthy of interpretation as the results appear to conflict with previous research that found associations between pronoun use and caregiver outcomes (Robbins, et al., 2012; Robbins et al., 2013; Connelly et al, 2020). Most notably, the results were not consistent with previous findings linking pronoun use, specifically PWD-focused pronouns (caregiver you-words, PWD I-words) and couple-focused pronouns (PWD we-words and caregiver we-words), with caregiver distress (Connelly et al, 2020). One possible explanation for the difference in results are the different outcome measures utilized in each study. The present study limited the caregiver outcomes to a mental health composite that combined caregiver depression and anxiety, while the previous study utilized a distress composite which consisted of measures of caregiver depression, anxiety, strain, and burden. A possibility is that caregiver strain and burden were the main drivers of the relationships between pronoun use and caregiver distress in the previous study. If so, this may provide further evidence for the notion that pronoun use in caregiver-patient dyads is more a reflection of the patients becoming the primary focus of the relationship rather than a sense of loss or connection between partners. As the focus of the relationship turns more towards the patient and less towards the couple, caregivers may feel more burdened and strained. Unfortunately, additional analyses could not be conducted examining this relationship as caregiver burden and strain data were only available for the subsample of caregivers used in the previous study.

Pronoun Use and Caregiver Mental Health after Caregiving Ends

Regarding caregiver mental health measured post-death, although no research thus far had linked pre-loss pronoun use with caregiver outcomes, theory and empirical findings from the grief literature suggest that a close and warm relationship between caregiver and care-recipient can predict worse mental health outcomes post-death. Given the link between relationship closeness and mental health outcomes after the death of a partner, it is surprising that personal pronoun use was not linked to caregiver mental health post-death. One possible explanation for the non-significant relationship with pronoun use was the collection of mental health outcomes of all caregivers whose patients passed away at the same timepoint. In our sample of respondents, lapsed time between the death of the PWD and the time that caregivers completed the follow-up survey ranged from 2-13 years (*M*=6.25, *SD*= 2.88) since the death of the PWD to the time caregivers completed the follow-up survey. In contrast, previous research establishing a relationship between relationship closeness and mental health outcomes after the death of a partner had followed up with caregivers within a year of their partner's death. Additionally, pronoun use was measured at the time of their lab visit, which occurred between 8-17 years ago for our sample (*M*=10.92, *SD*=1.85). It is likely that the effects of pronoun use on mental health outcomes of caregivers weakens over time. Indeed, several caregivers added an optional comment in their surveys responses to indicate that the questions weren't relevant to them given the time that had passed. For example, one participant wrote, "Most of these questions seem to not apply to me now that my husband has died almost 7 years before." Another shared, "I really don't think this questionnaire pertained to me as my husband passed away in 2011. It's been years ago that I was a caregiver." Future studies would benefit from employing a more systematic follow-up protocol beginning soon after the care-recipient has passed away.

Additionally, data collection was conducted before and during the COVID-19 pandemic while shelter-at-home orders were in place, which may have contaminated the results. Given that the CES-D-R asks participants to rate their depressive symptoms over the past 7 days, and the BAI asks participants to rate their anxiety symptoms over the past 2 weeks, it is likely the crisis had led some caregivers to respond in a way that is not in line with their usual functioning. Indeed, several caregivers wrote in to share that their responses would have likely been different if completed before the crisis. For example, one caregiver wrote, "Some of the questions about recent weeks were hard to answer because of the shelter in place mandates, which limit the ability to get out and socialize." Another asked, "Do you think the current shutdown may have skewed a portion of my answers? I am normally a very positive person, for me and those around me, but we have been experiencing a very screwed up month!" Others reported feeling triggered by the questions, with one caregiver expressing, "I appreciate the importance of your work and study, but think that in this time of Covid-19/forced isolation some of the questions may need to be reconsidered." Although it may be too soon to fully understand the full effects of the mandated self-isolation due to COVID-19, previous research examining the psychological toll on those quarantined during the SARS pandemic of 2003 may provide us with a clue. For example, Hawryluk and colleagues (2004) found that 31% of individuals quarantined during the SARS pandemic reported CES-D scores above 16, the typical cutoff for depressed individuals. However, it is important to note that the effects of forced isolation on mental health may not be the same for all. For example, social distancing may have a more negative impact on the mental health of extroverts than individuals who are more introverted. This, in combination with some caregivers' anecdotes related to their experience of completing the survey during the COVID-19 pandemic suggests the validity of our follow-up data collected during the pandemic may have been jeopardized by history effects.

Lastly, seven caregivers in the follow-up study indicated they had since remarried. One caregiver wrote, "My first wife was unable to walk and had severe dementia. I cared for her for four years and she died in August 2012. I remarried in 2015 and have an excellent relationship and retired life with my second wife." Another caregiver who reported being newly partnered shared, "My wife was an extraordinary life partner for 46 years. Her bravery made my care-giving effortless. Incredibly, I am blessed with a new partner and life as I knew it goes on." Indeed, research suggests that although newly remarried spouses do not differ initially than those who stay widowed, they report more life satisfaction and less stress after 5 years of marriage (Burks, Lund, Gregg, & Bluhm, 2008). The follow-up data in our study were collected an average of 6.38 years after the death of the PWD. This provides further evidence that pronoun use measured at the time of caregiving, at times occurring up to 17 years prior to the follow-up data were collected, may not have been as impactful for many of our caregivers.

Strengths and Limitations

The primary strength of this study was its use of an established methodology for studying semi-naturalistic dyadic interactions and a reliable coding system to examine pronoun use during PWD-caregiver interactions. Whereas most research has examined pronoun use by using text analysis software that automatically detect and quantifies the total occurrences of individual pronouns used, this study was unique in that it employed a context analysis procedure for measuring pronoun use in PWD-caregiver interactions that helped isolate the use of pronouns to those that referred to each partner and the couple as a whole. Finally, analyses included two different patient groups in comparison to non-symptomatic caregivers, which allowed for the investigation of whether changes in pronoun use were specific to patients with bvFTD and their caregivers, or generalized across patients with neurodegenerative disease.

There are several limitations to this study. One is that the conflict conversation paradigm, which occurred in a lab, may not be an accurate reflection of the interactions between patients and caregivers in their daily lives. Another limitation of this study was that participants completed separate measures for depression and anxiety at the time of caregiving, which then had to be converted to a common metric, and it is possible that important information was lost in the process. Also, the large gaps and varying timespans between the collection of the follow-up data and the death of the PWD across caregivers may have limited our ability to capture the effects of pronoun use that may have emerged earlier. Thus, we cannot be sure if we missed effects that later dissipated. Additionally, the true effects of pronoun use on caregiver mental health after the death of the PWD may have been contaminated due to a large portion of the data collection occurring amidst the COVID-19 crisis and shelter-at-home mandates. A final methodological limitation of this study was the small sample size used in the 3rd aim. Given the relatively small sample size, there is a good likelihood that this analysis was underpowered to detect effects.

Significance

The PWD-caregiver relationship is one of the most important relationships that has implications for people's well-being in our current world. As the number of older Americans continues to rise, and with estimates indicating that there are 5.5 million cases of AD and 60,000 cases of FTD currently in the US, it becomes increasingly important to conduct research that benefits our understanding of the PWD-caregiver relationship. The present study examined the use of personal pronouns in PWDs and their spousal caregivers. Results revealed that PWDs with bvFTD used more I-words and less you-words than all other diagnostic and partner groups, while caregivers of PWDs with bvFTD use more you-words and less I-words than all other diagnostic and partner groups. The study also examined the association between pronoun use by PWDs and caregivers on caregiver mental health at the time of caregiving and after the death of PWD. However, the findings did not support a link between pronoun use by either partner and caregiver mental health at either time point. This research helps us better understand the socio-emotional impact of neurodegenerative disease on PWDs and their spousal caregivers and contributes important new information to the literature on diagnostic differences in interpersonal functioning.

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Table 1
Pronoun Coding System

I-words	You-word	We-words	"You and I"-phrases
I	You	Our	I and you
I'd	You'd	Ours	Me and you
I'll	You'll	Ourselves	Mine and yours
I'm	You're	Us	Myself and yourself
I've	You've	We	You and I
Me	Your	We'd	You and me
Mine	Yours	We'll	Yours and mine
My	Yourself	We're	Yourself and myself
Myself		We've	

Table 2

Aim 1. Sociodemographic Characteristics, Patient Clinical Variables, and Caregiver Variables of Interest

	bvFTD Patients	AD Patients	bvFTD Caregivers	AD Caregivers	Healthy Controls
N	64	75	64	75	114
Sex (male)	47	47	18	27	57
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Age	63.76 (7.32)	65.45 (9.47)	59.40 (7.62)	61.35 (9.87)	63.71 (12.44)
I-words %	.69	.55	.33	.43	.53
You-words %	.19	.27	.49	.40	.31
We-words %	.12	.18	.17	.17	.16
CDR BOX	6.16 (3.35)	4.46 (2.10)	-	-	-
NPI	45.05 (21.30)	18.23 (18.42)	-	-	-

Notes. NPI and CDR scores only available for patients.

Table 3

Aim 2: Sociodemographic Characteristics, Patient Clinical Variables, and Caregiver Variables of Interest

	Patients	Caregivers
N	173	173
Sex (male)	65	108
	M (SD)	M (SD)
Age	64.76 (7.98)	63.70 (8.10)
I-words %	.61 (.19)	.38 (.12)
You-words %	.26 (.15)	.44 (.16)
We-words %	.14 (.12)	.17 (.13)
CDR BOX	4.51 (2.83)	-
NPI	30.10 (22.07)	-
Mental Health Composite	-	.02 (.80)

Notes. NPI and CDR scores only available for patients. Mental health scores only available for caregivers.

Table 4
Matched Depression Items from CES-D-R and SCL-90-R Subscale for Item Analysis

CESD-R items	SCL-90-R Depression Subscale matched items
3. I felt that I could not shake off the blues even with help from my family or friends.	30. Feeling Blue
7. I felt that everything I did was an effort.	71. Feeling everything is an effort
8. I felt hopeful about the future.	54. Feeling hopeless about the future
9. I felt my life had been a failure	79. Feelings of worthlessness
14. I felt lonely.	29. Feeling lonely
17. I had crying spells.	20. Crying easily
20. I could not get “going”.	14. Feeling low in energy or slowed; 71. Feeling everything is an effort
Unmatched CES-D-R items	Unmatched SCL-90-R items
1. I was bothered by things that usually don't bother me.	5. Loss of sexual interest or pleasure
2. I did not feel like eating; my appetite was poor.	15. Thoughts of ending your life
4. I felt just as good as other people.	20. Feeling of being trapped or caught
5. I had trouble keeping my mind on what I was doing.	26. Blaming yourself for things
6. I felt depressed.	31. Worrying too much about things
10. I felt fearful.	32. Feeling no interest in things
11. My sleep was restless.	
12. I was happy.	
13. I talked less than usual.	
15. People were unfriendly.	
16. I enjoyed life. (reversed)	
18. I felt sad.	
19. I felt that people disliked me.	

Table 5

Matched Anxiety Items from BAI and SCL-90-R Subscale for Item Analysis

BAI items	SCL-90-R Anxiety Subscale matched items
4. Unable to relax	57. Feeling tense of keyed up; 78. Feeling so restless you couldn’t sit still
5. Fear of worst happening	33. Feeling fearful
7. Heart pounding/racing	39. Heart pounding or racing
9. Terrified or afraid	23. Suddenly scared for no reason; 33. Feeling fearful; 72. Spells of terror
10. Nervous	2. Nervousness or shakiness
12. Hands trembling	17. Trembling
13. Shaky / unsteady	2. Nervousness or shakiness
17. Scared	23. Suddenly scared for no reason; 33. Feeling fearful; 72. Spells of terror
Unmatched BAI items	Unmatched SCL-90-R items
1. Numbness or tingling	80. Feeling that unfamiliar things are strange or unreal
2. Feeling hot	86. Feeling pushed to get things done
3. Wobbliness in legs	
6. Dizzy or lightheaded	
8. Unsteady	
11. Feeling of choking	
14. Fear of losing control	
15. Difficulty in breathing	
16. Fear of dying	
18. Indigestion	
19. Faint / lightheaded	
20. Face flushed	

Table 6

Correlations Between Matched Items (bolded) on BAI and SCL-90-R subscales

	2. Nervousness or shakiness	17. Trembling	23. Suddenly scared for no reason	33. Feeling fearful	39. Heart pounding or racing	57. Feeling tense of keyed up	72. Spells of terror	78. Feeling so restless you couldn't sit still
4. Unable to relax	.494**	.316**	.333**	.401**	.441**	**.586****	.440**	**.496****
5. Fear of worst happening	.565**	.328**	.489**	**.671****	.471**	.608**	.548**	.439**
7. Heart pounding/racing	.542**	.518**	.504**	.472**	**.853****	.591**	.499**	.518**
9. Terrified or afraid	.525**	.449**	**.663****	**.805****	.542**	.576**	**.750****	.445**
10. Nervous	**.689****	.294**	.526**	.607**	.490**	.699**	.490**	.438**
12. Hands trembling	.423**	**.599****	.355**	.272**	.378**	.334**	.298**	.239**
13. Shaky / unsteady	**.556****	.639**	.547**	.427**	.568**	.486**	.514**	.435**
17. Scared	.552**	.432**	**.621****	**.855****	.497**	**.628****	.702**	.510**

*Note: p<.01***

Table 7

Aims 2 & 3: Correlations Between Patient Pronoun Use, Mental Health Outcomes, and Covariates

	1	2	3	4	5	6	7	8	9	10
1. PWD I-words	-									
2. PWD You-words	-.751**	-								
3. PWD We-words	-.632**	-.037	-							
4. Mental Health Composite	.122	-.057	-.119	-						
5. Post Mental Health Composite	.036	-.315	.363	.464*	-					
6. CG Gender	.117	-.007	-.166*	.247**	-.308	-				
7. CG Age	-.057	-.020	.109	-.092	-.075	-.039	-			
8. NPI Score	.268**	-.150	-.232**	.267**	.161	.185*	-.087	-		
9. CDR Box Score	.294**	-.082	-.349**	.172*	-.450*	.183*	-.126	.492**	-	
10. Time Since Death of PWD	.158*	-.056	-.173*	.076	.056	.084	-.112	.076	.205**	-

Note: *p*<.001 ***, *p*<.01 **, *p*<.05 *

Table 8

Aims 2 & 3: Correlations Between Caregiver Pronoun Use, Mental Health Outcomes, and Covariates

	1	2	3	4	5	6	7	8	9	10
1. CG I-words	-									
2. CG You-words	-.661**	-								
3. CG We-words	-.345**	-.476	-							
4. Mental Health Composite	-.081	.125	-.062	-						
5. Post Mental Health Composite	-.169	.127	.086	.464*	-					
6. CG Gender	-.090	.125	-.166*	.247**	-.308	-				
7. CG Age	-.018	-.109	.109	-.092	-.075	-.039	-			
8. NPI Score	-.166*	.324**	-.232**	.267**	.161	.185*	-.087	-		
9. CDR Box Score	-.280**	.400**	-.349**	.172*	-.450*	.183*	-.126	.492**	-	
10. Time Since Death of PWD	-.047*	-.098	-.173*	.076	.056	.084	-.112	.076	.205**	-

Note: *p*<.001 ***, *p*<.01 **, *p*<.05 *

Table 9

Aim 2a: PWD Pronoun Use and Caregiver Mental Health during Caregiving

	PWD *I-words*		PWD *You-words*		PWD *We-words*	
	B (*SE*[*B*])	β	*B* (*SE*[*B*])	β	*B* (*SE*[*B*])	β
Pronoun Type	.13 (.34)	-.02	-.28 (.42)	-.05	.13 (.52)	.02
Caregiver Sex	.37 (13)	.22**	.37 (.13)	.22**	.38 (.13)	.23**
NPI score	.17 (.07)	.21*	.17 (.07)	.21*	.17 (.07)	.22*
CDR Score	.01 (.08)	.01	.02 (.08)	.02	.02 (.08)	.02

Note: *p*<.01 **, *p*<.05 *

Table 10	*Aim 2b: Caregiver Pronoun Use and Caregiver Mental Health during Caregiving*					
	Caregiver *I-words*		Caregiver *You-words*		Caregiver *We-words*	
	B (*SE*[*B*])	β	*B* (*SE*[*B*])	β	*B* (*SE*[*B*])	β
Pronoun Type	.01 (.40)	.00	.02 (.40)	-.00	-.03 (.47)	-.01
Caregiver Sex	.37 (13)	.23**	.37 (.13)	.23**	.37 (.13)	.23**
NPI score	.17 (.07)	.22*	.17 (.07)	.22*	.17 (.07)	.22*
CDR Score	.02 (.08)	.02	.02 (.08)	.02	.02 (.08)	.02

Note: *p*<.01 **, *p*<.05 *

Table 11 *Aim 3a: PWD Pronoun Use and Caregiver Mental Health Post-Death*

	PWD *I-words*		PWD *You-words*		PWD *We-words*	
	B (*SE*[*B*])	β	*B* (*SE*[*B*])	β	*B* (*SE*[*B*])	β
Pronoun Type	-.17 (1.08)	-.03	-1.25 (1.27)	-.20	2.49 (1.59)	.29
Mental Health - Caregiving	.49 (.20)	.47*	.42 (.21)	.41	.43 (.19)	.41*

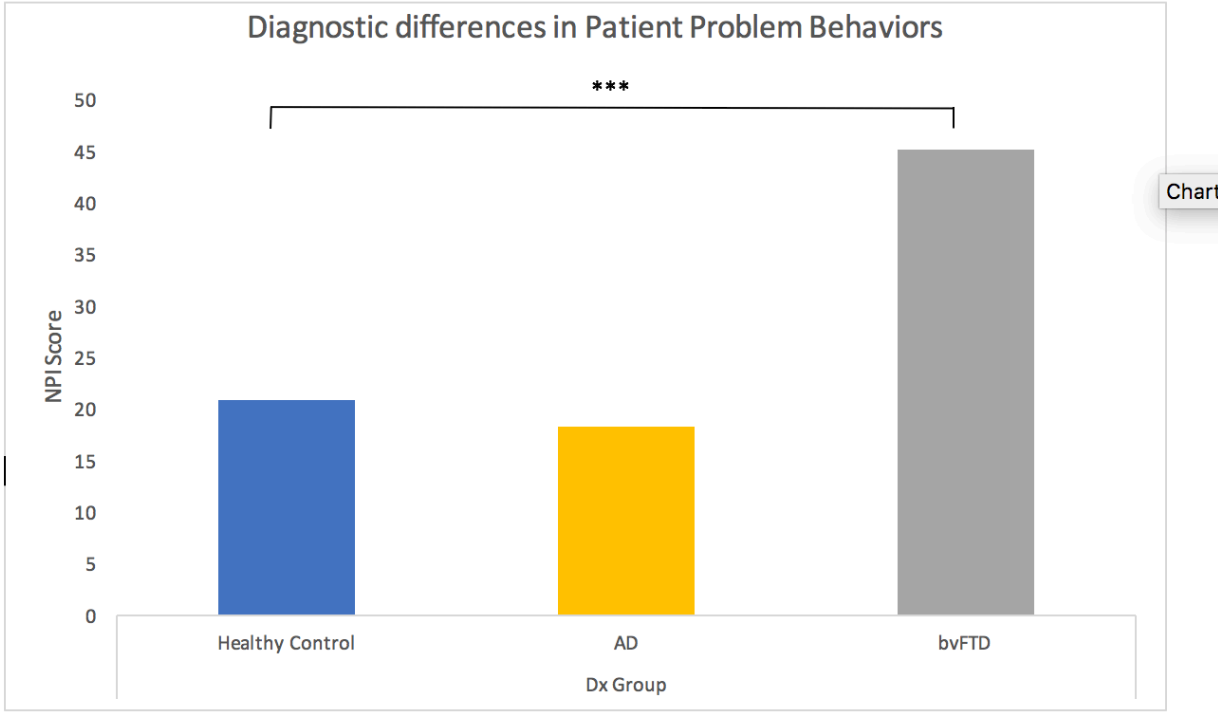
Note: *p*<.01 **, *p*<.05 *

Table 12 *Aim 3b: Caregiver Pronoun Use and Caregiver Mental Health Post-Death*

	Caregiver *I-words*		Caregiver *You-words*		Caregiver *We-words*	
	B (*SE*[*B*])	β	*B* (*SE*[*B*])	β	*B* (*SE*[*B*])	β
Pronoun Type	-.17 (1.08)	-.03	-1.25 (1.27)	-.20	2.49 (1.59)	.29
Mental Health - Caregiving	.49 (.20)	.47*	.42 (.21)	.41	.43 (.19)	.41*

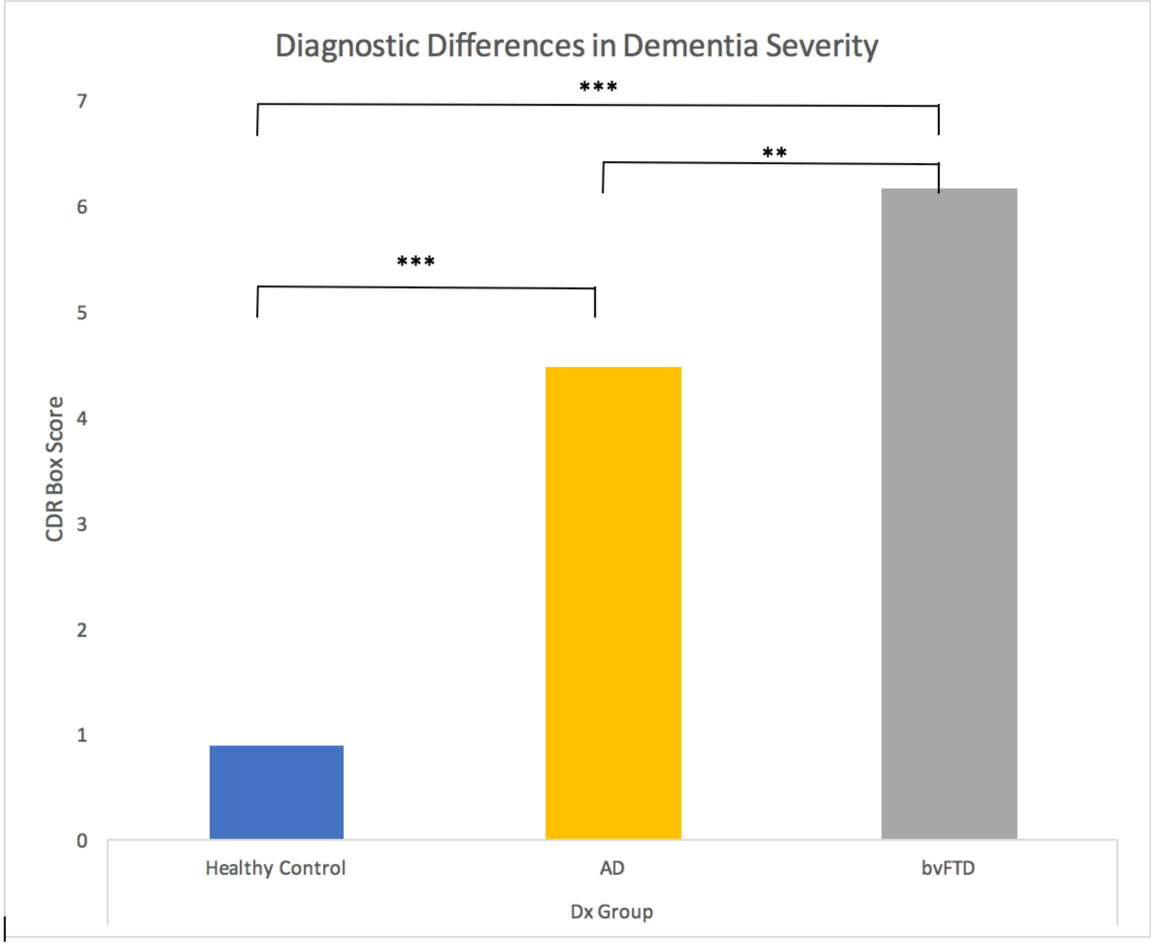
Note: *p*<.01 **, *p*<.05 *

Figure 1.



Note: p<.001 ***

Figure 2.



Note: *p*<.001 ***, *p*<.01 **