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Taking the Good With the Bad: Ambivalent Ties and Health in Later Life

DISSERTATION

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for the degree of

DOCTOR OF PHILOSOPHY

in Psychological Science

by

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DEDICATION

for Maria

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ABSTRACT OF THE DISSERTATION

Taking the Good With the Bad: Ambivalent Ties and Health in Later Life

by

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Distinguished Professor Emerita Karen S. Rook, Chair

Relationships that are sources of both positive and negative experiences (i.e., ambivalent ties) are understudied, and findings are mixed regarding their influence on health. This dissertation, accordingly, examined whether exposure to ambivalent ties differentially relates to health outcomes depending on how it is operationalized (Study 1), whether the link between ambivalent ties and cognitive functioning is moderated by interpersonal coping (Study 2), and whether the daily coupling of ambivalent ties and health limitations is moderated by affect valuation (Study 3). Community-dwelling older adults in the greater Austin, Texas area (N = 333 at baseline, ages 65-92 years old) completed an in-person interview at baseline, followed by a self-administered questionnaire (returned by mail), and 5-6 days of ecological momentary assessment (EMA) surveys. Findings revealed that the proportion of ambivalent ties in one's total network was the best operationalization of exposure to ambivalent ties in the current dataset (Study 1); ambivalent ties were related to poor cognitive functioning, a link not readily buffered by coping strategies (Study 2); and the daily coupling of ambivalent ties and health limitations was buffered by affect valuation (Study 3). Implications for models

of ambivalent ties and health, as well as practical implications for older adults' health and well-being, are discussed.

INTRODUCTION

Rapid rates of population aging worldwide make it essential to understand social determinants of health in later life. Being integrated in a strong network of social ties is important not only for everyday wellbeing, but predicts long-term health and mortality at a magnitude rivaling that of conventional risk factors including smoking and obesity (Holt-Lunstad et al., 2010). Social ties provide individuals with support and resources in times of need, as well as camaraderie and companionship. Relationships can also be challenging, provoking a range of frustrations from petty annoyances to conflict and rejection. Not uncommonly, some relationships have both elements. Social ties that are sources of both positive and negative experiences, referred to as *ambivalent ties*, have been found to represent up to nearly half of a person's social network (Campo et al., 2009). Given the robust literature demonstrating the health protective effects of supportive ties vs. deleterious effects of problematic ties, it is surprising that comparatively fewer studies have examined the interplay of positive and negative interactions occurring within the same relationship. The existing evidence thus far suggests that ambivalent ties indeed have unique implications for health and well-being.

Evidence Linking Ambivalent Ties to Poor Health

Although ambivalent ties entail a mix of positive and negative experiences, the bulk of current theory and research indicates that such ties adversely impact numerous facets of physical health, including greater functional limitations (Rook et al., 2012), poorer cardiovascular functioning (Holt-Lunstad et al., 2003), and shorter telomeres (an indicator of cellular aging; Uchino et al., 2012). Moreover, ambivalent ties appear to have worse health consequences than do purely negative ties (Carlisle et al., 2012). According

to the Social Ambivalence and Disease (SAD) model (Holt-Lunstad & Uchino, 2019), ambivalent ties are uniquely detrimental to health because they both exacerbate stress and interfere with support effectiveness.

The model proposes several conceptual reasons for these effects. First, interactions with ambivalent ties may feel unpredictable or ambiguous, leading to increased anxiety and rumination (i.e., stress-enhancement hypothesis). When seeking social support from ambivalent ties, individuals may be more guarded, less trusting, and ultimately perceive the support provision as ineffective (i.e., support-interference hypothesis). Additionally, the positive qualities of ambivalent ties might suggest that individuals care more about these relationships, as compared to solely problematic ties, perhaps leading individuals to take negative exchanges (e.g., criticism, rejection) more personally. Finally, the SAD model proposes that ambivalent ties have ample opportunity to influence health in these ways because individuals often maintain close and frequent contact with these ties. Indeed, ambivalent ties are most often family members (Fingerman et al., 2004), and familial ties may not be easily avoided – particularly among older adults, who tend to have kin-dominated networks (Carstensen et al., 1999). Studies have found that ambivalent ties comprise as much as 27-43% of older adults' social networks as whole (Fingerman et al., 2004; Campos et al., 2009), more than 50% of adult intergenerational ties (van Gaalen, 2010), and at least 70% of older spousal relationships (Uchino et al., 2014).

Evidence Linking Ambivalent Ties to Better Health

In contrast to the SAD model, emerging research suggests that ambivalent ties may not always be detrimental to health in later life. In fact, one study showed that older adults with extended kin networks characterized by high support and high strain (i.e., ambivalent) exhibited better physiological profiles (longer telomeres) than did older adults with only supportive

networks (Lincoln et al., 2019), which is in direct contrast to previous findings linking ambivalent ties to shorter telomeres (Uchino et al., 2012). Another study found that older adults with family networks characterized by high support and high conflict exhibited good functional health (Girardin et al., 2018), the opposite of previous findings linking ambivalent ties to poor functional health (Rook et al., 2012). Finally, a study by Xu and colleagues (2016) found that more frequent negative marital experiences, such as feeling bothered by or having conflicts with their spouse, were associated with slower rates of cognitive decline across 15 years. Links between ambivalent ties and cognitive health have rarely been examined, but these findings suggest that it is crucial to consider the role of ambivalent ties for this health domain, as well. These disparate findings raise important, and understudied, questions about the specific contexts in which ambivalent ties may be beneficial, or at least not harmful, to health and well-being.

Dissertation Aims and Overview

The current series of studies aim to investigate potential reasons for the inconsistent findings linking ambivalent ties and health in later life. First, ambivalent ties have been operationalized in several ways across studies. Study 1, accordingly, examined whether different operationalizations of exposure to ambivalent ties exhibit distinctive associations with physical and cognitive health among older adults. Second, the literature on ambivalent ties and health has not yet adequately examined cognitive health domains. Scholars have posited that negative exchanges with close ties could benefit cognitive health if individuals use cognitively engaging coping strategies (e.g., interpersonal problem solving; e.g., Xu et al., 2016), but this speculation has not been directly tested. Study 2, accordingly, examined associations between ambivalent ties and cognitive

functioning and whether older adults' interpersonal coping strategies may moderate this association. While engaged interpersonal coping strategies are posited to be cognitively stimulating, thereby exhibiting potential associations with cognitive health, it is also important to consider psychosocial factors that might moderate the link between ambivalent ties and physical health. In particular, affective valuation (or the extent to which people appraise affective experiences as pleasant, useful, appropriate, and meaningful) may be a promising avenue of investigation, given prior evidence that greater valuation of negative affect may attenuate the adverse health impacts of negative affective experiences (Luong et al., 2016). Study 3, accordingly, examined the link between older adults' daily exposure to ambivalent ties and physical health limitations and whether affective valuation moderates this link. Together, these studies aimed to shed light on mixed findings regarding the associations between ambivalent ties and health, and to extend currently limited understanding of potential psychosocial factors that might buffer or exacerbate these associations.

STUDY 1

Defining Exposure to Ambivalent Ties

Over two decades of research has yielded insights into the underlying causes and resulting health impacts of ambivalent relationships (see reviews by Connidis, 2015; Holt-Lunstad & Uchino, 2019). Considerable variation still exists, however, in how ambivalent relationships are theoretically and empirically defined across different literatures. Moreover, the mechanisms through which these ties impact health remain poorly understood. The Social Ambivalence and Disease (SAD) model posits that greater exposure (e.g., having many ambivalent ties and/or frequent interactions with them) is a central mechanism through which ambivalent ties impact health (Holt-Lunstad & Uchino, 2019). Specifically, the authors argue that the degree to which ambivalent ties influence health depends on their pervasiveness. An area of ambiguity within this model, however, is how to define exposure and whether various types of exposure may have differential implications for health.

Pervasiveness of Ambivalent Ties Across Social Network

Exposure to ambivalent ties – or the extent of their pervasiveness – can be conceptualized in several ways. Perhaps the most straight forward measure is the sheer number of ambivalent social ties within a person's social network. This operationalization captures the overall quantity of ambivalent ties and has been related to poorer health outcomes with relative consistency (e.g., Brown & Rook, 2022; Uchino et al., 2012). Given that a larger overall network size has been linked to health benefits (Berkman et al., 2000), however, the sheer number of ambivalent ties might be confounded by the overall number ties within a person's social network.

Alternatively, the proportion of ambivalent ties in one's social network provides an indication of how "saturated" an individual's network is with ambivalent ties, relative to how

many people are in their network overall. Estimates of how saturated older adults' networks are with ambivalent ties have differed across studies, depending on the measures used to identify ambivalent ties. When ambivalent ties were defined as relationships perceived as both emotionally close and bothersome, ambivalent ties represented 27% of older adults' social ties (Fingerman et al., 2004). When ambivalent ties were defined as people who could be both helpful and upsetting when the participant needed emotional, practical, or informational support (in a study of adults ages 50-80), approximately 43% of participants' social ties were classified as ambivalent (Campo et al., 2009). In another study, in which older adults were asked to report the social ties who were sources of positive and/or negative exchange(s) in the past month, ambivalent ties (classified as ties that were sources of at least one positive and one negative exchange) were found to represent slightly under 10% of social ties (Rook et al., 2012). Many studies have reported the proportion of ambivalent ties as descriptive information, but few examined whether the proportion itself was associated with health outcomes.

Perceived Closeness of Ambivalent Ties

What kinds of relationships are more likely to be ambivalent? Previous findings suggest that ambivalent ties are typically relationships that are perceived as close and important (Fingerman et al., 2004), such as family members, lifelong friends, or a spouse. Interestingly, the health effects of ambivalent ties have been shown to differ depending on the role relationship (an approximate indicator of closeness) of those ties. For instance, Rook et al. (2012) found that negative exchanges with ambivalent family members predicted worse physical and emotional health, whereas negative exchanges with ambivalent non-family ties were unrelated to the measured health outcomes (in a representative sample of older adults in the United States). In contrast, de Bel & Widmer (2024) found that a higher ratio of ambivalent family members was

related to greater social wellbeing (measured by feelings of social connectedness), whereas a higher ratio of ambivalent non-family ties was related to lower social wellbeing (among a sample of Swiss young adults). The age and cultural differences between the two samples could account for the divergent findings, but these studies nonetheless suggest that the role relationship and/or closeness of ambivalent ties are important factors to consider. Because role relationships do not perfectly map on to perceived closeness, per se, the current sought to examine whether the pervasiveness of ambivalent ties across individuals' close (vs. less close) social ties might have differential associations with health.

Contact Frequency with Ambivalent Ties

Exposure to ambivalent ties can also be thought of in terms of their physical presence or contact frequency. Individuals with highly ambivalent networks (whether in sheer number or proportion) most likely interact with ambivalent ties on a frequent basis – although this assumption has not been directly tested. Because ambivalent ties are both close and pervasive, researchers have inferred that contact with ambivalent ties is frequent (e.g., Holt-Lunstad & Uchino, 2019). It is plausible, however, that ambivalent ties might instead be associated with infrequent contact. For instance, negative exchanges with ambivalent ties may sometimes involve rejection, neglect, or failure to provide support (e.g., Rook et al., 2012) – exchanges that might be indicative of infrequent contact. An older adult parent may be simultaneously loved and yet neglected by their adult child who is too busy to visit them (e.g., due to competing demands at work or home life), exemplifying an ambivalent relationship characterized by infrequent contact. Contact frequency has rarely been directly assessed, however, making it unclear whether the degree of contact with ambivalent ties indeed determines the degree to which they influence health.

Current Study

The current study sought to address these gaps through a conceptual and empirical investigation, guided by existing theory, of various possible operationalizations of exposure to ambivalent ties. Specifically, analyses were conducted to examine: 1) the pervasiveness (number vs. ratio) of ambivalent ties across older adults' social networks; 2) whether their pervasiveness differs across levels of perceived closeness; 3) the degree of contact frequency with ambivalent ties; and 4) whether these various types of exposure are differentially related to health outcomes among older adults.

Method

Participants and Procedures

Data were collected in 2016-2017 as part of the Daily Experiences and Well-being Study (DEWS; Karen L. Fingerman, Principal Investigator), a study of community-dwelling older adults in the greater Austin, Texas area. Eligibility criteria included being age 65 or older, residing at home, not working full time, and not exhibiting cognitive impairment (based on a brief screener; Callahan et al., 2002). Participants were recruited by telephone using random digit dialing of all landline telephones in the Austin Metropolitan Statistical Area (based on the US Census, 2009-2014). Oversampling in high-density minority zip codes was conducted to increase representation of racial and ethnic minority groups. Telephone screening was conducted by a telephone call center, the Survey Research Operations Survey Services Laboratory. Of all eligible adults identified through screening, 66% agreed to participate in the study (N = 333, ages 65-92 years old, 55% female, 67% non-Hispanic White).

Participants completed an in-person baseline interview that assessed their social network ties, health and wellbeing, and sociodemographic characteristics. Following the interview,

participants also completed a self-administered questionnaire (returned by mail) and 5-6 days of daily mobile assessments. The current study used data from the in-person baseline interview, as it included the most detailed assessment of all social network ties. Participants received $50 after completing the baseline interview and an additional $100 after completing the daily assessments. All study procedures were approved by the Institutional Review Boards at the University of Texas at Austin (Title: Daily Experiences and Well-Being; Protocol No. 2015-02-0123).

Measures

Social Convoy

During the baseline in-person interview, participants completed a convoy diagram of their social ties (Antonucci, 1986). Using a diagram of three concentric circles, participants were asked to write down the first name and last initial of the people most important to them in order of perceived closeness/importance. In the innermost circle, participants indicated the person(s) to whom they feel so close that it is hard to imagine life without them. In the second circle, participants indicated the person(s) that may not be quite as close but are still very important to them. In the outermost circle, participants indicated person(s) that had not yet been mentioned but are close enough and important enough in the participant's life that they should be included in the diagram. To complete the assessment within a reasonable timeframe, participants were permitted to name up to 10 social ties in each circle for a possible maximum of 30 ties in total. The number of ties named across all circles was used to indicate total network size.

Aversiveness and Supportiveness of Social Ties

After completing the convoy, participants rated the aversiveness and supportiveness of their 10 closest ties from the convoy (i.e., first 10 names, irrespective of circle location). Two

items assessed aversiveness: 1) "How much is [NAME of social tie] critical of you and what you do?" and 2) "How much does [NAME] get on your nerves?". Three items assessed supportiveness: 1) "How much can you share your very private feelings and concerns with [NAME]?", 2) "How much can you rely on [NAME] to help if you have a serious problem?", and 3) "Overall, how much does [NAME] love and care for you?". Participants responded to each item using a 5-point Likert scale (1 = *not at all*, 2 = *a little*, 3 = *somewhat*, 4 = *quite a bit*, and 5 = *a great deal*). Internal consistency was higher among the among supportiveness items (Cronbach's alpha = .76) than among the aversiveness items (Spearman-Brown coefficient[1] = .54). Consistent with prior studies (Campo et al., 2009; Rook et al., 2012), ambivalent ties were classified based on an absolute cutoff of exhibiting any degree of aversiveness and any degree of supportiveness (i.e., rated as at least "a little" on either of the aversiveness items and at least "a little" any of the supportiveness items).

Contact Frequency

For each of their social ties, participants were asked: 1) "How often do you see [NAME of social tie] in person?" and 2) "How often do you have contact with [NAME] by phone, by text, or by other means?" Responses (1 = *daily*, 2 = *a few times a week*, 3 = *weekly*, 4 = *a few times a month*, 5 = *monthly*, 6 = *a few times a year*, 7 = *once a year*, 8 = *less than once a year or never*) were reverse coded so that higher scores represent more frequent contact. Reverse coded items were averaged across all ambivalent ties to obtain separate scores for average in-person and average remote (phone/text/other) contact frequency with ambivalent ties.

Physical Health

[1] Spearman-Brown (split-half) coefficient was used for the two aversiveness items because item error variances were not equivalent (Eisinga et al. 2012).

Three measures assessed physical health during the baseline interview. To assess *health conditions*, participants were asked "Has a doctor ever told you that you have…" followed by a list of eight chronic health conditions (high blood pressure/hypertension; diabetes/high blood sugar; cancer/malignant tumor, excluding minor skin cancer; chronic lung disease such as chronic bronchitis/emphysema; coronary heart disease or other heart problems; stroke; arthritis/rheumatism; osteoporosis/osteopenia; Wallace & Herzog, 1995). The number of conditions endorsed by the participant was summed for total number of health conditions.

Participants also completed the short form health survey (Ware & Sherbourne, 1992). Items assessing general health and functional limitations were used for the current study. To assess *general health*, participants were asked "In general, would you say your health is…" followed by five response options (1 = *excellent*, 2 = *very good*, 3 = *good*, 4 = *fair*, 5 = *poor*). Responses were reverse coded so that higher scores represent better general health. To assess *functional limitations*, participants rated the extent to which their physical health limits them in 10 activities: vigorous activities (e.g., running, heavy lifting), moderate activities (e.g., vacuuming, bowling), lifting/carrying groceries, climbing several flights of stairs, climbing one flight of stairs, bending/kneeling/stooping, walking more than a mile, walking several blocks, walking one block, and bathing/dressing yourself. Initial response options were presented as 1 (limited a lot), 2 (limited a little), and 3 (not limited at all). Each item was later coded so that 0 = *not limited at all*, 1 = *limited a little*, 2 = *limited a lot*; all items were averaged together with higher scores representing greater functional limitations.

Cognitive Functioning

The baseline interview also included cognitive assessments that were spaced intermittently between the other measures. Details regarding administration and scoring for each of the cognitive tests are presented in Study 2. Briefly, participants completed four cognitive tests commonly used to assess memory (Hopkins Verbal Learning Test – Form 3; Brandt, 1991), verbal fluency (Controlled Oral Word Association Test; Benton, 1968), executive function (Trail Making Test – difference between Trails A-B; Army Individual Test Battery, 1944), and crystalized intelligence (Shipley Institute of Living Scale – Vocabulary subtest; Shipley, 1940). All four cognitive scores were standardized and averaged together (α = .59), with higher scores indicating better overall functioning.

Analytic strategy

Preliminary analyses examined frequency distributions of aversiveness and supportiveness item responses. Alternative possible cut-offs for classifying ambivalent ties were explored. Once ambivalent ties were classified, steps were taken to calculate possible indicators of exposure to ambivalent ties (e.g., number, ratio, contact frequency). The number and ratio of ambivalent ties were also considered in the context of perceived closeness (i.e., convoy circle location). Descriptive analyses and intercorrelations among these exposure variables and physical and cognitive health measures were explored to identify which types of exposure exhibit the strongest associations with health.

Data Exclusions

Twenty-three convoy members (across 5 participants) had insufficient data regarding positive and negative exchanges to determine whether they were ambivalent ties. Three of these participants had insufficient data for only one or two (i.e., less than 20%) of their ties; these participants were retained in analyses, and their ties with missing positive and negative

exchanges data were still included in computations of total network size. The other two participants had missing data for all or nearly all (90% or more) of their ties and were excluded from analyses. Finally, one participant who reported no ties was also excluded from analyses, given that older adults without a social network (i.e., socially isolated) versus those with a social network void of ambivalent ties (i.e., not isolated) represent qualitatively different populations. Our data, therefore, do not allow for the distinction between these two types of zeros (zero ties vs. zero ambivalent ties). The final analytic sample included 3,026 convoy members across 330 participants.

Results

Preliminary Analyses

Although the absolute cut-off approach used to classify ambivalent ties is theoretically driven and empirically validated (Campos et al., 2009; Holt-Lunstad & Uchino, 2019), variation still exists across studies in the items used to assess aversiveness and supportiveness of social ties. Given that the two items assessing aversiveness in the current study were only moderately correlated ($r = .37$, $p < .001$), an alternate classification of ambivalent ties was explored wherein participants' perception of how critical the social tie is was used as the only indicator of aversiveness.[2] Classifications based on one aversiveness item (i.e., ambivalent ties defined as supportive and critical) vs. based on both aversiveness items (i.e., ambivalent ties defined as supportive and *either* critical or annoying) were strongly correlated ($r = .77$, $p < .001$); therefore,

[2] The criticism item was selected, rather than the annoyance item (how much social tie gets on participant's nerves), because criticism responses were slightly better distributed (see Table 1.1) and more consistently related to each of the supportiveness items ($rs = .05$ to $.12$, $ps < .01$). The positive correlations also indicate that ties perceived as more critical were also perceived as more supportive. Annoyance, in contrast, was inversely and more weakly correlated with the supportiveness items ($rs = -.06$ to $-.004$, $ps = < .001$ to $.83$). Taken together, it was determined that criticism (as opposed to annoyance) might be a better indicator of aversiveness in the context of identifying ambivalent ties.

analyses moved forward with the original classification approach of using both aversiveness items.

As an alternative to the absolute cut-off, the current study also explored whether an empirically based cut-off (i.e., median split) would yield different classifications of ambivalent ties. For instance, would ambivalent ties classified as both highly aversive and highly supportive (rather than any degree of aversiveness and supportiveness) be rarer and/or exhibit stronger associations with health? Unfortunately, these questions were unanswerable based on the current sample due to the low means for both aversiveness items (see Table 1.1; median and modal response was "not at all" for both items), which is consistent with previous studies (Campos et al., 2009). In other words, the median split vs. theoretical cut-off were identical with respect to levels of aversiveness. Analyses and results, therefore, are discussed in terms of the theoretically driven absolute cut-off approach.

Descriptive Analyses of the Closeness of Ambivalent Ties

Among participants with ambivalent ties (n = 320), the perceived closeness of ambivalent ties was also considered as a possible indicator of exposure to ambivalent ties. As shown in Table 1.2, ambivalent ties were primarily identified within the first and second circles. A one-way repeated measures ANOVA tested whether the number of ambivalent ties in each circle significantly differed. The total number of ambivalent ties in each circle was entered as the within-subjects factor with three levels (first, second, and third circle); no between-subjects factor was entered. Mauchly's Test of Sphericity indicated that the variances of the differences between levels were not equal ($p < .001$); because the assumption of sphericity was violated, the Greenhouse-Geisser corrected results are reported. The omnibus finding revealed that the number of ambivalent ties was not the same in each convoy circle; $F(1.64, 540.48) = 140.35$, $p <$

.001, (η^2 = .299). Follow-up tests with Dunn-Bonferroni correction for multiple comparisons revealed that, on average, participants had a greater number of ambivalent ties in their first circle (M = 2.90) compared to their second (M = 1.70; $p < .001$) and third circles (M = 0.46; $p < .001$); the difference between means for the second and third circles was also significant ($p < .001$). These results suggest that the number of ambivalent ties was greater in each successively closer convoy circle, consistent with prior work showing that close ties are more likely to be ambivalent compared to less close ties (Fingerman et al., 2004). Given the relatively higher density of ambivalent ties in the first (innermost) circle, compared to the second and third circles, the pervasiveness of ambivalent ties was examined in two ways: a) number/ratio of ambivalent ties across the total convoy and b) number/ratio of ambivalent ties in the first circle.

Exposure to Ambivalent Ties Across Levels of Perceived Closeness

The means, standard deviation, and range for the number vs. ratio of ambivalent ties in each convoy circle are presented in Table 1.3. Correlations among all possible exposure variables (number/ratio in total convoy, number/ratio in first circle, and contact frequency) are presented in Table 1.4. The constructed measures of number and ratio of ambivalent ties were correlated but not strongly enough to suggest redundant constructs (r = .14 - .63). Regarding contact frequency, participants reported in-person contact with ambivalent ties approximately a few times per month, with remote contact occurring approximately once per week. Bivariate correlations revealed that the pervasiveness of close of ambivalent ties (i.e., ratio of ambivalent ties in circle 1) was unrelated to contact frequency (remote or in-person). Having a highly ambivalent network overall (i.e., number and ratio of ambivalent ties in total convoy) was associated with less frequent contact. Only the number of close ambivalent ties (in circle 1) was associated with more frequent remote, but not in-person, contact.

Differential Associations Between Measures of Exposure to Ambivalent Ties and Health

The final goal of the current study was to investigate whether these various types of exposure are differentially related to health outcomes among older adults. As shown by the correlation matrix in Table 1.4, the ratio of ambivalent ties in the total convoy was the only operationalization of exposure that was consistently related to all health outcomes. Specifically, a higher ratio of ambivalent ties in one's social network overall was associated with more chronic health conditions, worse general health, more functional limitations, and worse cognitive functioning – consistent with existing evidence that ambivalent ties are detrimental to numerous facets of health and well-being (Holt-Lunstad & Uchino, 2019; Ross et al., 2019). Although the other exposure variables were not significantly related to most of the other health outcomes (with the exception of general health), all correlations were in the expected direction. Unexpectedly, contact frequency (either remote or in-person) with ambivalent ties was not significantly related to any health outcomes.

A comparison of the standardized correlation coefficients in a one-tailed[3] asymptotic z-test (Lee & Preacher, 2013), revealed that ratio (vs. number) of ambivalent ties in the total convoy was more strongly related to cognitive functioning ($Z = |4.55|$, $p < .001$) and marginally more strongly related to functional limitations ($Z = |1.36|$, $p = .088$). The magnitude of their correlations with the other health measures (chronic conditions or general health) did not significantly differ.

Discussion

The Social Ambivalence and Disease (SAD) model argues that exposure to ambivalent ties is a primary mechanism through which such ties influence health and wellbeing (Holt-

[3] A one-tailed test was used given that the direction of the difference was known for all comparisons.

Lunstad & Uchino, 2019). It is surprising, therefore, that "exposure" is not clearly defined in the theoretical model and has been inconsistently operationalized across empirical studies of ambivalent ties. The current study, accordingly, investigated the similarities (and differences) of various operationalizations of exposure to ambivalent ties, and whether these measures were differentially related to physical and cognitive health outcomes among older adults.

The main finding was that the ratio of ambivalent ties across an individuals' total social network was the most consistently related to all health measures. The ratio of ambivalent ties, specifically, has not been often examined as a predictor of health and wellbeing. One study among Swiss young adults, however, revealed findings that contrast with the dominant view of ambivalent relationships as harmful to health. The researchers found that participants with a higher ratio of ambivalent family members exhibited greater social wellbeing (measured by feelings of social connectedness), after adjusting for network size and sociodemographic covariates (de Bel & Widmer, 2024). These effects were not as strong as those of positive family members on wellbeing, but nonetheless, their findings are surprising in view of the extensive evidence to the contrary.

Why might ratio (rather than number) of ambivalent ties be associated with older adults' health? The ratio of ambivalent ties in one's overall social network may best capture their pervasiveness because it reflects the extent to which their network is saturated with ambivalent ties. Older adults with a higher ratio of ambivalent ties, by definition, have a lower ratio of non-ambivalent ties; thus, their options for high quality support and companionship are more limited. Previous evidence suggests that even small amounts of negative social experiences can have powerful effects on health and well-being that are unmatched by positive social experiences (e.g., Baumeister et al., 2001; Newsom et al., 2005). Adages such as "one bad apple spoils the

bunch" also reflect the known potency of bad over good. This potency notwithstanding, strong evidence also supports the view that positive experiences can have stress-buffering effects (e.g., Cohen & Wills, 1985; Fredrickson et al., 2000). It is possible, therefore, that older adults with a higher ratio of ambivalent ties have fewer available opportunities for positive social experiences with other (non-ambivalent) ties to buffer, or offset, the stressful experiences encountered with ambivalent ties.

Number of ambivalent ties, in contrast, may act as a proxy for overall network size. Network size is related to health and mortality risk, but relationship quality, connectedness, and role diversity are also strong predictors of health and well-being (e.g., Berkman et al., 2000; Cohen et al., 1997; Holt-Lunstad et al., 2010). Moreover, the number and role diversity of ambivalent ties were found to have opposing implications for well-being (Brown & Rook, 2022). Thus, the sheer number of ambivalent ties may be difficult to tease apart from these confounding factors. Additionally, the number of ambivalent ties is agnostic to number of non-ambivalent ties, whereas the ratio of ambivalent ties captures the number of ambivalent ties *relative* to the number of non-ambivalent ties. Older adults with more non-ambivalent (or positive) ties may have more available options for social support and connection, possibly enabling them to feel less reliant upon their ambivalent ties. Indeed, the association between higher ratio of ambivalent ties and less frequent social contact observed in the current study suggests that older adults may be hesitant to interact with (and perhaps rely on) their ambivalent ties.

Consideration of Contact Frequency

Does greater closeness necessarily mean greater exposure to ambivalent ties? Based on the current study, the answer appears to be no, not necessarily. The current findings provided no evidence that ambivalent ties perceived as more close/important are contacted with greater

frequency. In fact, greater saturation of ambivalent ties (i.e., higher proportion) was associated with less frequent contact with ambivalent ties overall. Contrary to the SAD model, which posits frequent contact as a mechanism through which ambivalent ties may harm health, the current finding suggests that individuals whose social network is heavily comprised of ambivalent ties may avoid frequent social contact. Given the plethora of studies demonstrating the harmful effects of low social engagement, it is possible that low (rather than high) contact frequency could operate as a mechanism through which ambivalent ties contribute to poor health. Fingerman et al. (2024) found that infrequent contact with close ties (termed long-duration dormant ties) exacerbates stressful encounters with those ties. It is possible that older adults intentionally minimize contact with ties that are sources of interpersonal stress (aligned with socioemotional selectivity theory; Carstensen et al., 1999) or, instead, that older adults' desire for frequent contact with close ties, if unmet or ignored, may act as a catalyst for interpersonal stress (aligned with the Social Relationship Expectations Framework; Akhter-Khan et al., 2023). In short, it seems that infrequent contact may either arise from or lead to ambivalent relationships. Future research could investigate whether minimizing contact with ambivalent ties could buffer or exacerbate the harmful effects of instances when contact does occur.

Strengths and Limitations

This study is the first, to my knowledge, to conduct a conceptual and empirical investigation of different operationalizations of exposure to ambivalent ties. Mixed findings exist regarding the health implications of ambivalent ties, which may be due in part to the inconsistent ways in which ambivalent ties have been operationalized across studies. Current study findings suggest that the ratio of ambivalent ties in one's total network might best capture exposure to ambivalent ties when the goal is to understand physical and cognitive health implications in later

life. The current study used a validated social network elicitation measure (i.e., social convoy diagram; Antonucci, 1986) and a theoretically driven approach to classifying ambivalent ties (Campos et al., 2009). Thus, findings can be interpreted with alignment to previous studies that have used similar measures.

It must be emphasized, however, that defining exposure to ambivalent ties greatly depends on the social network elicitation approach and the types of positive and negative exchanges used to classify ambivalent ties. For instance, the aversiveness items assessed in this study (criticism, annoyance) differ from those used in other studies such as rejection, lack of support, and how upsetting the social tie is within support seeking contexts (e.g., Newsom et al., 2005; Campo et al., 2009). Introducing more complexity, other studies have examined feelings of ambivalence (e.g., simultaneous feelings of love and resentment toward the social tie) that more directly assess participants' awareness of conflicting feelings (e.g., Losada et al., 2017) – as opposed to indirectly classifying ambivalent ties through researcher-generated thresholds for positivity and negativity. Some evidence suggests that the former (direct) approach is more predictive of well-being than indirect approaches (Suitor et al., 2011). Taken together, studies using different items/measures may therefore result in different conclusions about which types of exposure to ambivalent ties most strongly relate to health.

An important limitation of the current study is that reverse causation is not addressed. Given that health problems in later life can be a source of social strain, more work is needed to parse out the causal direction of associations found in the current study. Finally, participants could name up to 30 social ties, but only the first 10 names were probed for aversive/supportive relationship qualities. The ratio of ambivalent ties in participants' total network, therefore, indicates the proportion of all ties that are *known* to be ambivalent, with the limitation that,

among participants whose network exceeds 10 ties, ambivalent status is not known for all ties.[4] As an alternate option, the ratio of participants' first 10 ties was considered as a possible operationalization of exposure to ambivalent ties. This approach yielded similar rates of ambivalent ties (56% of participants 10 closest ties were ambivalent), but with the limitation that participants' top 10 ties may have varying degrees of closeness (i.e., coming from different circles). Because interpretation of this proportion option was less intuitive, this approach was not included in further analyses.

Conclusion

The current findings highlight the need to clarify what constitutes "greater exposure" to ambivalent ties in existing theoretical models of ambivalent ties and health. The pervasiveness of ambivalent ties, and the extent to which they influence health processes, is not necessarily reflected in contact frequency, as has been previously suggested. Instead, the proportion of ambivalent ties, relative to non-ambivalent ties, in older adults' social networks, may be most strongly related to health outcomes – particularly cognitive and functional limitations. More work is needed to examine causal direction and to examine whether these associations are robust beyond sociodemographic factors known to predict health and wellbeing in later life.

[4] 70.61% of participants had additional (i.e., >10) ties that were not probed for aversiveness/supportiveness (M = 5.90 ties that were not probed, SD = 5.92, range = 0 – 20). Of the ties probed for relationship qualities (i.e., maximum 10 ties per participant), on average, slightly more than half (M_{ratio} = .56, SD = .29) were ambivalent.

Table 1.1

Response Distribution for Aversiveness and Supportiveness of Each Social Tie

	Negative Exchanges		*Positive Exchanges*		
Response Option	Critical *n* (%)	Annoy *n* (%)	Confide *n* (%)	Rely *n* (%)	Love *n* (%)
Not at all	1743 (57.68)	1817 (60.07)	472 (15.60)	353 (11.68)	56 (1.85)
A little	686 (22.70)	843 (27.87)	620 (20.50)	398 (13.17)	172 (5.69)
Somewhat	281 (9.30)	271 (8.96)	625 (20.66)	516 (17.07)	411 (13.60)
Quite a bit	167 (5.53)	77 (2.55)	711 (23.50)	701 (23.20)	861 (28.49)
A great deal	145 (4.80)	17 (0.56)	597 (19.74)	1054 (34.88)	1522 (50.36)
Totals					
n	3022	3025	3025	3022	3022
M (*SD*)	1.77 (1.13)	1.56 (0.80)	3.11 (1.36)	3.56 (1.38)	4.20 (1.00)
Range	1 – 5	1 – 5	1 – 5	1 – 5	1 – 5

Note. Total *N* = 3026 social ties across 330 participants (*n*s vary across items due to missing data). Aversiveness items assessed the extent to which each tie is critical of the participant (Critical) and gets on their nerves (Annoy). Supportiveness items assessed the extent to which the participant can share private feelings with each tie (Confide), rely on them for help (Rely), and they love and care for the participant overall (Love).

Table 1.2

Distribution of Ambivalent Ties by Perceived Closeness

	Proportion of total ambivalent ties	
Convoy Location	*M* (*SD*)	Range
Circle 1	.60 (.34)	0-1
Circle 2	.32 (.29)	0-1
Circle 3	.09 (.18)	0-1

Note. n = 320 participants with ambivalent ties (10 participants without any ambivalent ties were excluded from these frequency distributions). This table shows the proportion of ambivalent ties that came from each convoy circle (i.e., denominator is total number of ambivalent ties). Convoy circles presented in order of perceived closeness (Circle 1 = closest ties, Circle 3 = less close ties).

Table 1.3

Makeup of Social Ties in each Convoy Circle

	Number of ties		Number of ambivalent ties		Ratio ambivalent[a]	
Convoy Location	*M* (*SD*)	Range	*M* (*SD*)	Range	*M* (*SD)*	Range
Circle 1	4.65 (2.98)	0-10	2.90 (2.26)	0-10	.64 (.36)	0-1
Circle 2	5.82 (3.05)	0-10	1.70 (1.85)	0-10	.35 (.36)	0-1
Circle 3	4.60 (3.46)	0-10	0.46 (1.03)	0-6	.13 (.28)	0-1
Total convoy	15.07 (6.93)	1-30	5.06 (2.79)	0-10	.41 (.27)	0-1

Note. N = 330. Convoy circles presented in order of perceived closeness (Circle 1 = closest ties, Circle 3 = less close ties).

[a]Third column shows the proportion of ambivalent ties in circles 1-3 (denominator is total number of ties in each circle) and the proportion of ambivalent ties in total convoy (denominator is total number of ties across all circles).

Table 1.4

Correlations Among Possible Operationalizations of Exposure to Ambivalent Ties and Physical and Cognitive Health Measures

Variable	*M* (*SD*)	1	2	3	4	5	6	7	8	9
Number Ambivalent										
1. Total convoy	5.06 (2.79)	--								
2. First circle	2.90 (2.26)	.63***	--							
Ratio Ambivalent										
3. Total convoy	.41 (.27)	.56***	.14*	--						
4. First circle	.64 (.36)	.57***	.53***	.51***	--					
Contact Frequency										
5. Remote	5.95 (1.20)	-.19***	.12*	-.22***	.04	--				
6. In-person	5.11 (1.48)	-.16**	.07	-.11†	.08	.66***	--			
Health										
7. Conditions	2.37 (1.45)	.06	.07	.12*	.03	-.02	-.03	--		
8. General	3.54 (1.02)	-.15**	-.15**	-.21***	-.20***	-.05	-.08	-.43***	--	
9. Functional	0.49 (0.57)	.04	.06	.11*	.07	.05	-.06	.45***	-.59***	--
10. Cognitive	0.00 (0.67)	-.04	-.05	-.27***	-.06	-.04	-.03	-.15*	.35***	-.17**

Note. $N = 330$ for all estimates except for correlations with contact frequency ($n = 320$) and cognitive health ($n = 288$). Contact frequency (average across ambivalent ties, 1 = *less than once a year or never* to 8 = *daily*). Conditions (sum of chronic health conditions, 0 to 8). General health (1 = *poor* to 5 = *excellent*). Functional health (average of 10 items, 0 = *not limited at all* to 2 = *limited a lot*). Cognitive health (composite of four tests, standardized and averaged together).

†$p = .08$. *$p < .05$. **$p < .01$. ***$p < .001$.

STUDY 2

Ambivalent Ties and Cognitive Functioning

Social relationships have been consistently linked to cognitive functioning in later life. Landmark studies, such as the MacArthur Studies of Successful Aging, have shown that the effect of social relationships on cognitive functioning is similar to that of known cognitive health predictors, such as education and income (Seeman et al., 2001). Research in this area has primarily examined the independent influences of positive and negative social exchanges on cognitive functioning (Seeman et al., 2001, 2011; Windsor et al., 2014; Zahodne et al., 2019). Surprisingly little attention has been given to the potential cognitive impact of relationships that are sources of both positive and negative exchanges (i.e., ambivalent ties). Given that ambivalent ties have been shown to influence physical health and psychological well-being in distinct ways from those of purely positive or negative ties (Holt-Lunstad & Uchino, 2019), it is important to understand how ambivalent ties may also influence cognitive health – a salient outcome in later life that is key to maintaining autonomy and quality of life.

Positive and Negative Social Exchanges and Cognitive Functioning in Later Life

Mixed findings exist regarding whether positive social exchanges are helpful or harmful for cognitive functioning. Positive exchanges, such as receiving social support and participating in enjoyable social activities, are often found to be a protective factor for cognitive health in later life (e.g., Evans et al., 2019; Seeman et al., 2001; Windsor et al., 2014). This protective effect is most often attributed to the cognitive stimulation derived from positive social engagement. According to the cognitive reserve hypothesis, cognitively stimulating activities help to strengthen neuroplasticity, making the brain more efficient and resilient against functional decline (Stern, 2002). Contrary to this protective mechanism, however, some evidence suggests

that support that is overbearing or unable to be reciprocated can erode one's sense of independence and self-efficacy (Baltes & Wahl, 1996; Bolger & Amarel, 2007), causing stress that ultimately leads to poorer cognitive functioning (Zahodne et al., 2019). Thus, the nature of social support may determine whether it is related to better or worse cognitive health profiles.

Similarly, mixed findings exist regarding associations between negative social exchanges and cognitive functioning. Some studies of older adults have shown that more frequent negative exchanges, such as criticism, excessive demands, and arguments, are related to better cognitive functioning (Seeman et al., 2001; Xu et al., 2016), whereas others have found the opposite (Liao et al., 2014; Seeman et al., 2011). In an 8-year study of older adults, negative exchanges with friends and family were associated with better cognitive functioning, whereas negative exchanges with spouses were associated with poorer cognitive functioning, after adjusting for sociodemographic and health factors (Windsor et al., 2014). Another study of older married couples, in contrast, found that more frequent negative exchanges with spouses predicted slower rates of cognitive decline across 15 years (Xu et al., 2016). The authors of the latter study posited that marital conflict prompts the search for solutions, such that older couples may have developed coping strategies that are protective against cognitive decline. More generally, these authors and others (e.g., Xu et al., 2016; Zahodne et al., 2019) have posited that negative social exchanges are cognitively stimulating because they often require the use of problem solving, reasoning, and other cognitive skills. These speculations have not been directly tested, however, and are particularly important to examine in the context of ambivalent relationships, given their prevalence in older adults' social networks.

Interpersonal Coping in Ambivalent Relationships

Three broad types of interpersonal coping behaviors have been identified in the literature (Birditt et al., 2009). *Engaged coping* involves constructive behaviors that are intended to mutually resolve the issue in a positive way, such as through joint problem solving and calmly discussing matters. *Avoidant coping* involves passive behaviors intended to circumvent the issue, such as not talking about distressing topics or ignoring tensions. *Destructive coping* involves negative or combative behaviors, such as fighting with or yelling at each other.

Older adults may use different strategies for dealing with interpersonal tensions in ambivalent relationships, as compared to other types of relationships. For instance, older adults are more likely to use engaged and/or conciliatory strategies (e.g., forgiveness, finding compromise) and less likely to use avoidant strategies with ambivalent ties, as compared with negative ties (Rook et al., 2012). These authors posited that older adults may be motivated to resolve, rather than avoid, tensions with ambivalent ties, given prior work showing that such ties are often close family members (Fingerman et al., 2004). Further evidence suggests that people are often committed to maintaining their ambivalent relationships (Bushman & Holt-Lunstad, 2009), which could manifest as a greater willingness to resolve conflicts. Well-intended efforts to resolve tensions are not always successful, however. Birditt et al. (2009) found that adult child-parent dyads who more often resort to destructive and avoidant strategies are more likely to be ambivalent. Taken together, it is evident that individuals may use a variety of coping strategies with ambivalent ties for a variety of reasons. It remains unclear, however, whether these strategies can alter how ambivalent ties are associated with cognitive functioning.

The three types of interpersonal coping strategies may have differing implications for cognitive functioning. Engaged coping may involve efforts to understand each other's point of

view, communicate clearly, and mutually reason or problem solve – presumably activating cognitive resources in the process of having done so. Avoidant coping, in contrast, may not activate cognitive resources if the individual chooses to simply "let it go" or perhaps deplete cognitive resources if the individual harbors resentment or negative mood (a correlate of poor cognitive functioning; Salthouse, 2014) due to unresolved tension. Similarly, destructive coping may utilize cognitive resources, but the heightened levels of stress and cardiovascular reactivity that accompany such behaviors may do more harm than good to cognitive health in older age groups (Euser et al., 2009).

Current Study

The current study examined whether these three interpersonal coping strategies moderate the association between exposure to ambivalent ties (i.e., having a greater proportion of ambivalent ties in one's social network) and cognitive functioning among older adults. Specifically, this study examined the following hypotheses:

- *Hypothesis 1* (*H1*): Greater exposure to ambivalent ties will be associated with worse cognitive functioning.
- *Hypothesis 2* (*H2*): Engaged interpersonal coping strategies will moderate this association, such that greater exposure to ambivalent ties will be related to better cognitive functioning among older adults who more often use engaged coping in response to interpersonal tensions.
- *Hypothesis 3* (*H3*): More frequent use of avoidant coping strategies in response to interpersonal tensions will strengthen the association between greater exposure to ambivalent ties and worse cognitive functioning.

- *Hypothesis 4* (*H4*): More frequent use of destructive coping strategies in response to interpersonal tensions will strengthen the association between greater exposure to ambivalent ties and worse cognitive functioning.

Method

Participants

Data were collected in 2016-2017 as part of the Daily Experiences and Well-being Study (DEWS; Karen L. Fingerman, Principal Investigator), a study of community-dwelling older adults (N = 333 at baseline, ages 65-92 years old) in the greater Austin, Texas area. See Study 1 for additional details on DEWS recruitment procedures. Participants with insufficient social convoy data (see Study 1 for details), missing responses on coping subscales, or incomplete cognitive assessments (n = 62) were excluded from analyses in the current study. The final analytic sample included 271 older adults.

Compared to excluded participants, those included in the final sample were more likely to be younger [$t(331) = 3.89$, $p < .001$], non-Hispanic White [$\chi^2(1) = 14.53$, $p < .001$], and have higher levels of education [$t(331) = -3.74$, $p < .001$]. The final sample (N = 271) was 65 to 89 years old (M = 73.49 years, SD = 6.32), 55% female, and 59% were married or cohabitating/living with partner. Most participants (72%) identified as non-Hispanic White, with 13% identifying as Black or African American, 13% identifying as both Hispanic and White, and the remaining 2% identifying as another mixed race/ethnicity, Hispanic or Latino only, Asian, or American Indian or Alaska Native. See Table 2.1 for additional sociodemographic information.

Procedures

Complete study procedures are presented in Study 1. Briefly, participants first completed a baseline in-person interview in which they provided information regarding their social

networks and sociodemographic characteristics and completed a cognitive assessment battery. After the interview ended, the interviewer provided a self-administered questionnaire that included questions about coping with interpersonal tensions, along with a pre-paid envelope for participants to return the completed questionnaire by mail (97% response rate). Participants were compensated $50 for completing these portions of the data collection.

Measures

Exposure to Ambivalent Ties

Exposure to ambivalent ties was calculated in two steps. First, during the global interview, participants were asked to complete a convoy diagram of their social ties (see Study 1 for details). After completing the convoy diagram, participants indicated the levels of aversiveness and supportiveness (1 = *not at all*, 5 = *a great deal*) of up to 10 of their closest ties from the convoy (see Study 1 for details). Consistent with prior studies (Campo et al., 2009), ambivalent ties were classified as ties exhibiting any degree of aversiveness and any degree of supportiveness.

Second, exposure to ambivalent ties was operationalized as the proportion of all social convoy ties that were coded as ambivalent (referred to here as *ambivalent ties ratio*). Higher proportions indicated the presence of more ambivalent ties in the participant's network relative to the total number ties. This approach also somewhat accounts for the number of positive (i.e., supportive only) ties in participants' social networks. Because negative (i.e., aversive only) ties were extremely rare in this sample (< 1%), the proportion can be approximately interpreted as the ratio of ambivalent ties to positive ties.

Cognitive Functioning

During the global interview, participants completed four cognitive tests commonly used to assess memory, verbal fluency, executive function, and crystalized intelligence. All four cognitive scores were standardized and averaged together to obtain an overall composite measure of cognitive functioning (α = .59)

The Hopkins Verbal Learning Test: Form 3 (HVLT; Brandt, 1991) was used to assess verbal learning and memory. Interviewers read a list of 12 nouns aloud from three categories (musical instruments, fuels, food flavorings) and asked participants to recall as many words as they could remember in any order. This process was repeated three consecutive times. After 20-25 minutes, participants were asked to recall the words once more without hearing the list again. The sum of correct non-repeated words across the first three trials (i.e., total immediate recall) and in the final trial (i.e., delayed recall) are standardized and averaged together, with higher scores indicating better memory.

The Controlled Oral Word Association Test (COWAT; Benton, 1968) was used to assess verbal fluency. Participants completed three trials in which they were given one minute to generate as many words as possible that started with a particular letter (F, A, S), excluding proper nouns and different forms of the same word (e.g., run, running). The sum of correct words across all three trials is used, with higher scores indicating better verbal fluency.

The Trail Making Test – Trails A and B (Army Individual Test Battery, 1944) were used to measure processing speed and executive functioning. In Trails A, participants were given a paper with numbers 1-25 randomly scattered across the page. Participants were asked to draw a continuous line as quickly as possible connecting the numbers in sequential order. Completion times were recorded in seconds, with faster times indicating better processing speed. In Trails B,

participants were given another paper with 25 numbers (1-13) and letters (A-L) scattered across the page. In this task, participants were asked to draw a continuous line as quickly as possible connecting the numbers and letters in alternating sequential order (e.g., 1-A-2-B-3-C…12-L-13). The amount of time in seconds required to correctly complete each trail was recorded. To control for the effect of psychomotor speed required by both trails, the difference scores (Trails A-B) were computed as an indicator of executive functioning (Corrigan & Hinkeldey, 1987; Drane et al., 2002). Difference scores were computed as A-B so that higher scores indicate better functioning.

Finally, crystalized intelligence was assessed using the Shipley Institute of Living Scale – Vocabulary subtest (Shipley, 1940), a 40-item vocabulary task. In each item, participants are given a prompting word, along with four possible comparison words. Participants must circle the one comparison word with the most similar meaning to the prompting word. Total number of correct items are summed, with higher scores indicating better crystalized intelligence.

Interpersonal Coping with Network Members

In the self-administered questionnaire, a 6-item measure assessed participants' behavioral reactions (i.e., engaged, avoidant, and destructive coping strategies) when encountering interpersonal problems with close social ties (Miller et al., 2009). Participants were asked to indicate how often they typically use the following strategies when irritated, hurt, or annoyed by people they feel close to and care about (1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *often*, and 5 = *almost always*). Engaged strategies included "I calmly discuss it with them" and "I try to find a solution" (α = .70). Avoidant strategies included "I accept that there is nothing I can do" and "I avoid talking about it with them" (α = .51). Destructive strategies included "I argue or fight with them" and "I yell or raise my voice at them" (α = .79). Interitem reliability for each subscale was

consistent with previous uses of this measure in older adult samples (Miller et al., 2009; Birditt et al., 2009). Cronbach's alpha is appropriate, and equivalent to the Spearman-Brown (split-half) coefficient, for the two-item subscales because the item error variances were equivalent (Eisinga et al. 2012). Items within each subscale were averaged, with higher scores indicating greater use of that interpersonal coping strategy.

All ambivalent ties assessed in this study fell within participants' top 10 closest network members derived from the social convoy diagram, which specifically captures close network ties in order of perceived closeness/importance. Thus, the phrasing of the interpersonal coping measure likely pertains to the ambivalent ties included in this study.

Covariates

All analyses adjusted for covariates commonly controlled for in the literature and known to be predictive of cognitive functioning in later life (Karlamangla et al., 2009; Salthouse, 2014), including age, sex (coded as 0 = *female*, 1 = *male*), race/ethnicity (dichotomized as 0 = *non-Hispanic White*, 1 = *Hispanic/Latino, Black/African American, or mixed/other*), education (rated as 1 = *no formal education*, 2 = *elementary school*, 3 = *some high school*, 4 = *high school*, 5 = *vocational*/*some college*, 6 = *college degree*, 7 = *some graduate work*, and 8 = *advanced degree*), marital status (dichotomized as 0 = *not married*, 1 = *married or living with partner*), and number of chronic health conditions (from a list of 8 conditions, including high blood pressure/hypertension, diabetes/high blood sugar, cancer/malignant tumor (excluding minor skin cancer), chronic lung disease such as chronic bronchitis/emphysema, coronary heart disease or other heart problems, stroke, arthritis/rheumatism, osteoporosis/osteopenia; Wallace & Herzog, 1995).

Analytic strategy

Hypotheses testing involved multiple linear regressions with interactions conducted using the PROCESS Macro (Hayes, 2022) on SPSS Version 29.0. The variables used to create each interaction term were mean centered by PROCESS in each model. Each coping strategy (engaged, avoidant, destructive) was examined as a separate moderator, given that their intercorrelations were only relatively moderate ($|r|$ = .03 to .49). All three models included overall cognitive functioning as the outcome, ambivalent ties ratio as the focal predictor, one of the coping strategies as the moderator, the interaction term, and the following covariates: age, sex, race/ethnicity (dichotomized), education, marital status, and number of chronic health conditions.

Because PROCESS does not provide assumptions tests, standardized coefficients for moderation models, adjusted R^2, or partial correlations (for computing effect sizes), these estimates were obtained using the SPSS REGRESSION command with standardized predictor variables to reduce multicollinearity. In these models, the interaction terms were standardized by computing the product of the standardized focal predictor (ambivalent ties ratio, Z_X) and each standardized moderator (coping strategy, Z_M) based on recommendations by Hayes (2022). The outcome (overall cognitive functioning) was regressed on Z_X, Z_M, and Z_XZ_M, along with the covariates, in each regression model. Effects sizes for each regression coefficient were computed as $f^2 = (\rho_p^2) / (1 - \rho_p^2)$ where ρ_p^2 is the squared partial correlation among each predictor and outcome (Cohen, 1988).

Assumptions

A Shapiro-Wilk test indicated that the composite measure of overall cognitive functioning was non-normally distributed ($p < .001$). Regressions are robust to moderate violations of normality within large datasets. Nonetheless, data transformations and outliers were

evaluated to determine whether the distribution could be improved. Monotonic square root or logarithm transformations were not possible given that the range of scores for the composite cognitive measure (i.e., the average of four standardized cognitive tests) included negative values (i.e., rank ordering would be disrupted). Nonmonotonic squared transformations were also explored but increased the skewness and kurtosis of the distribution. Three extreme scores were identified based cognitive composite z-scores beyond |3| *SD* units away from the mean. Removing these three participants did not improve the Shapiro-Wilk test and only slightly reduced the kurtosis and skewness of the distribution. Additionally, the study results were largely unchanged with or without the exclusion of these participants and they were therefore retained in analyses. No outliers were identified based on a global index of influence (standardized DFFITS > |1|) across all regression models where the cognitive composite measure was entered as the outcome. Assumptions of homoscedasticity and normality of errors were met, and multicollinearity among predictors was low (VIFs ranged from 1.01 to 1.46 across analyses).

Results

Descriptive Information

The means, standard deviations, and correlations among all study variables are presented in Table 2.1. On average, 39% of participants' social ties were classified as ambivalent (range = 0% to 100%). This ratio is similar to what was found in some studies (Campo et al., 2009; Fingerman et al., 2004) but diverges from others (Rook et al., 2012). Engaged coping was the most frequently used strategy, with 71% of participants trying to find a solution often or always, and 84% calmly discussing matters at least some of the time. Avoidant coping was more evenly distributed, with 38% sometimes avoiding and 41% sometimes accepting nothing can be done.

Destructive coping was uncommon in this sample, with most participants reporting rarely or never arguing (72%) or yelling (71%).

Are Ambivalent Ties Related to Overall Cognitive Functioning? (H1)

Three linear regression models with interactions, adjusting for covariates, examined whether the ratio of ambivalent ties in older adults' social networks was related to overall cognitive functioning, and whether this link was moderated by any of the three types of interpersonal coping strategies (engaged, avoidant, destructive). In all models, regardless of which coping strategy was included as the moderator, ambivalent ties ratio was significantly related to overall cognitive functioning (see Table 2.2). Specifically, the conditional main effects revealed that a higher ambivalent ties ratio was associated with worse cognitive functioning at average levels of engaged coping [b = -.48, SE = .14, $t(261)$ = -3.46, $p < .001$, f^2 = .05], at average levels of avoidant coping [b = -.49, SE = .14, $t(261)$ = -3.53, $p < .001$, f^2 = .05], and at average levels of destructive coping [b = -.46, SE = .14, $t(261)$ = -3.36, $p < .001$, f^2 = .04]. For comparison, although few studies have examined the link between ambivalent ties and cognitive health, these effect sizes were similar to that of the association between relationship quality (ambivalent vs. supportive) and cardiovascular functioning in a previous study (Holt-Lunstad & Clark, 2014). As reflected in the standardized regression coefficients in Table 2.2, the magnitudes of these effects were slightly greater than those of age and equivalent to slightly more than half that of education – both of which are well-known predictors of cognitive functioning in later adulthood (Lövdén et al., 2020; Salthouse, 2014).

Does Engaged Coping Moderate the Link Between Ambivalent Ties and Overall Cognitive Functioning? (H2)

Results from the model including engaged coping as the moderator are presented in Table 2.2 (first panel). Overall, the model explained 33% of the variation in overall cognitive functioning [Adj. R^2 = .33, $F(9,261) = 15.99$, $p < .001$]. Although ambivalent ties ratio was a significant unique predictor of cognitive functioning in this model (as noted above), engaged coping was non-significant [b = -.02, SE = .05, $t(261) = -0.44$, p = .66, f^2 = .001], and the interaction of ambivalent ties ratio and engaged coping was non-significant [b = -.02, SE = .21, $t(261) = -0.08$, p = .94, f^2 = .0001]. These results, therefore, do not provide evidence to support the hypothesis that engaged coping enhances overall cognitive functioning.

Does Avoidant Coping Moderate the Link Between Ambivalent Ties and Overall Cognitive Functioning? (H3)

Results from the model including avoidant coping as the moderator are presented in Table 2.2 (middle panel). Overall, the model explained 34% of the variation in overall cognitive functioning [Adj. R^2 = .34, $F(9,261) = 16.22$, $p < .001$]. Although ambivalent ties ratio was a significant unique predictor of cognitive functioning in this model (as noted above), avoidant coping was non-significant [b = .04, SE = .05, $t(261) = 0.84$, p = .40, f^2 = .003], and the interaction of ambivalent ties ratio and avoidant coping was non-significant [b = .16, SE = .18, $t(261) = .89$, p = .38, f^2 = .004]. These results, therefore, do not provide evidence to support the hypotheses that avoidant coping exacerbates the link between greater exposure to ambivalent ties and worse cognitive functioning.

Does Destructive Coping Moderate the Link Between Ambivalent Ties and Overall Cognitive Functioning? (H4)

Results from the model including destructive coping as the moderator replicated those of the other parallel models (see Table 2.2, third panel). Again, the overall model explained 34% of

the variation in overall cognitive functioning [Adj. R^2 = .34, F(9,261) = 16.44, p < .001]. Although ambivalent ties ratio was a significant unique predictor of cognitive functioning in this model (as noted above), destructive coping was non-significant [b = -.04, SE = .04, t(261) = -0.84, p = .40, f^2 = .003], and the interaction of ambivalent ties ratio and destructive coping was non-significant [b = .25, SE = .16, t(261) = 1.53, p = .13, f^2 = .01]. These results, therefore, do not provide evidence to support the hypotheses that destructive coping exacerbates the link between greater exposure to ambivalent ties and worse cognitive functioning.

Follow-up Analyses of Separate Cognitive Measures

Given that overall cognitive composite had only moderate internal consistency (α = .59), follow-up analyses of the separate cognitive tests (HVLT, COWAT, Trails A-B, and Shipley) were conducted. Initial bivariate correlations revealed that greater use of engaged coping was marginally related to worse performance on Trails A-B (r = -.10, p = .09), and avoidant coping was marginally related to better performance on Trails A-B (r = .11, p = .08) – both of which were trending in a direction contrary to what was expected. Intercorrelations among coping strategies and the other cognitive tests were non-significant. For each hypothesized interaction between ambivalent ties and each coping strategy (H2 – H4), four additional regression models were conducted with the separate cognitive tests as outcomes. These additional models were conducted using the PROCESS Macro (Hayes, 2022) on SPSS Version 29.0. The variables used to create each interaction term were mean centered by PROCESS in each model. Significance tests were based on an alpha level of .05, but results are also interpreted based on hypotheses-specific Bonferroni adjustment for multiple analyses across separate cognitive tests (p < .0125).

Engaged Coping Follow-up Tests (H2)

In models examining performance on HVLT [Adj. R^2 = .14, F(9,261) = 6.07, p < .001] and Shipley [Adj. R^2 = .31, F(9,261) = 14.17, p < .001] as outcomes, having a higher ratio of ambivalent ties in one's network was associated with fewer words remembered on the HVLT [b = -.86, SE = .22, t(261) = -3.84, p < .001, 95% CI_{boot} (-1.35, -0.37)] and fewer correct vocabulary words identified on the Shipley [b = -4.12, SE = 1.22, t(261) = -3.38, p < .001, 95% CI_{boot} (-7.05, -1.47)]; no significant effect of engaged coping (p = .29 and .43, respectively) or the interaction term (p = .35 and .43, respectively) emerged in either of these models. In models examining performance on COWAT as the outcome, no significant predictors emerged beyond the covariates (all ps > .05).

Only the model examining Trails A-B scores as the outcome [Adj. R^2 = .15, F(9,261) = 6.40, p < .001] revealed an interaction term that was significant at p < .05, but marginal at the p < .0125 Bonferroni-adjusted threshold [b = -44.68, SE = 17.86, t(261) = -2.50, p = .0129, 95% CI_{boot} (-79.84, -9.52)]. Probing the interaction for conditional effects at various levels of the moderator revealed that, unexpectedly, among participants with high (+1 *SD*) levels of engaged coping, a higher ambivalent ties ratio was related to worse performance on Trails A-B (b = -53.58, SE = 18.25, t(261) = -2.94, p = .004). This finding is contrary to what was hypothesized (H2). Among participants with average (M) levels of engaged coping, ambivalent ties ratio was marginally related to worse Trails A-B performance [b = -21.51, SE = 11.86, t(261) = -1.81, p = .07, 95% CI_{boot} (-44.87, 1.84)], which is consistent with the expected direction in H1. At low (-1 *SD*) levels of engaged coping, ambivalent ties ratio was not significantly related to Trails A-B performance (p = .53). A visualization of this interaction is presented in Figure 2.1.

Avoidant Coping Follow-up Tests (H3)

Parallel regressions with avoidant coping as the moderator revealed similar findings. In models examining performance on HVLT [Adj. R^2 = .14, F(9,261) = 5.85, p < .001] and Shipley [Adj. R^2 = .31, F(9,261) = 14.18, p < .001] as outcomes, having a higher ratio of ambivalent ties in one's network was associated with fewer words remembered on the HVLT [b = -.90, SE = .22, t(261) = -4.05, p < .001, 95% CI_{boot} (-1.39, -.42)] and fewer correct vocabulary words identified on the Shipley [b = -4.22, SE = 1.21, t(261) = -3.49, p < .001, 95% CI_{boot} (-7.17, -1.51)]; no significant effect of avoidant coping (p = .86 and .22, respectively) or the interaction term (p = .75 and .80, respectively) emerged in either model. In models examining performance on COWAT and Trails A-B as outcomes, no significant predictors emerged beyond the covariates (all ps > .05).

Destructive Coping Follow-up Tests (H4)

Parallel regressions with destructive coping as the moderator replicated the same pattern of results. In models examining performance on HVLT [Adj. R^2 = .14, F(9,261) = 5.90, p < .001] and Shipley [Adj. R^2 = .30, F(9,261) = 13.96, p < .001] as outcomes, having a higher ratio of ambivalent ties was again associated with fewer words remembered on the HVLT [b = -.89, SE = .22, t(261) = -4.00, p < .001, 95% CI_{boot} (-1.38, -.43)] and fewer correct vocabulary words identified on the Shipley [b = -4.12, SE = 1.21, t(261) = -3.39, p < .001, 95% CI_{boot} (-7.07, -1.43)]; no significant effect of destructive coping (p = .49 and .76, respectively) or the interaction term (p = .87 and .78, respectively) emerged in either model. In models examining performance on COWAT, again, no significant predictors emerged beyond the covariates (all ps > .05). Finally, the model examining Trails A-B as the outcome revealed a marginally significant interaction term [b = 25.20, SE = 14.28, t(261) = 1.77, p = .08, 95% CI_{boot} (-5.99, 52.57)]. Given that the bootstrapped confidence interval included zero, together with the Bonferroni correction,

the interaction term was not probed for conditional effects. Neither destructive coping nor ambivalent ties ratio were significantly related to Trails A-B beyond the covariates (all *p*s > .05).

Sensitivity Power Analysis

In cases of secondary data analysis (as in the current study) researchers have recently recommended the use of sensitivity analyses in lieu of post-hoc power analyses, given that the latter is merely a transformation of the observed *p*-value and therefore a misleading representation of power (Dziak et al., 2020; Perugini et al., 2018). Following these recommendations, sensitivity analyses were conducted to determine the minimum detectable effect (i.e., target effect size) that could be reliably detected given the current sample size (N = 271), desired power (.80), and alpha level (.05). Using Stata Version 18.0, these parameters were entered into the POWER PCORR function, which estimates the minimum detectable effect size and target squared partial correlation for multiple linear regression. Results revealed that the effect sizes of all statistically significant results ($p < .05$) in our study were similar (or slightly higher) to the minimum detectable effect size based on our study parameters, suggesting that our study was sufficiently powered to reliably detect the effects that were observed.

Discussion

Despite accumulating evidence that ambivalent social ties influence physical and emotional health (Holt-Lunstad & Uchino, 2019; Ross et al., 2019), surprisingly few studies have examined their influence on cognitive health domains. Positive and negative social exchanges have been independently associated with cognitive functioning, although inconsistent findings exist regarding the direction of these associations (e.g., Seeman et al., 2001, 2011). These inconclusive findings may be due, in part, to lack of attention to relationships in which positive and negative social exchanges co-occur (i.e., ambivalent ties). Additionally, a key

mechanism postulated to explain how social exchanges impact cognitive health – interpersonal coping strategies – has yet to be directly tested. The primary aims of this study, accordingly, were to examine (a) the link between ambivalent ties and cognitive functioning, and (b) whether this link was moderated by interpersonal coping strategies (engaged, avoidant, or destructive).

Overall, the findings supported the hypothesis that ambivalent ties are related to worse cognitive health among older adults. Specifically, greater exposure to ambivalent ties (i.e., higher ambivalent ties ratio) was associated with poorer overall cognitive functioning (composite measure), as well as worse performance on the verbal memory task (HVLT immediate and delayed recall) and on the crystalized intelligence task (Shipley vocabulary test). These results are consistent with, and extend, prior evidence that ambivalent ties are detrimental to numerous facets of health (e.g., Holt-Lunstad et al., 2003; Rook et al., 2012; Uchino et al., 2012). Prior work has focused on the physical and emotional health costs of ambivalent ties, and the current findings suggest that these consequences may also extend to cognitive health.

On the other hand, these findings stand somewhat in opposition to other work suggesting that that negative social exchanges with close ties (which bears similarity to how ambivalent ties have been operationalized in some studies, e.g., Fingerman et al., 2004) can be protective of cognitive health (e.g., Windsor et al., 2014; Xu et al., 2016). Researchers have postulated that individuals may be motivated to resolve interpersonal tensions with close ties in a constructive manner (i.e., engaged coping) because of a desire to preserve goodwill and maintain the relationship (e.g., Rook et al., 2012). Constructive and engaged coping strategies (e.g., mutual problem solving) are, in turn, posited to be cognitively stimulating (Xu et al., 2016). The current study tested this idea but found no evidence that greater use of engaged interpersonal coping in response to interpersonal tensions was associated with enhanced cognitive functioning. To the

contrary, one of the models revealed that greater use of engaged coping exacerbated the link between ambivalent ties and poor performance on the executive functioning task (Trails A-B).

Why engaged coping might exacerbate the adverse link between ambivalent ties and executive functioning is unclear. Engaged coping requires greater focus/attention, self-regulation, and emotional processing, than other types of coping – which was initially hypothesized to be cognitively stimulating. It seems that such resource-intensive coping efforts may have the opposite effect, however, given that older adults exhibit greater physiological susceptibility to heightened stress levels compared to younger adults (Charles, 2010). Indeed, a recent study found that greater coping effort was associated with a 14% greater mortality-risk across 16-year follow-up period among older men in the United States (Marino et al., 2024). This interpretation is partially supported by the marginal correlation between greater avoidant coping and better executive functioning, suggesting that choosing to "let it go" might preserve older adults' cognitive resources (although this association was not robust to inclusion of sociodemographic covariates). It is also possible that attempts to communicate and problem solve, if unsuccessful or not reciprocated by the social partner, could increase (rather than decrease) distress surrounding the issue. Heightened stress could, in turn, contribute to poorer cognitive functioning (Euser et al., 2009). The current study did not assess coping successfulness or partners' reactions the participant's coping efforts, but studies taking a dyadic approach would help to address these questions.

It should be emphasized, however, that the moderating effect of engaged coping was not found for the other cognitive measures (HVLT, Shipley, COWAT, or the overall composite). These findings are consistent with some studies suggesting that negative social processes (e.g., overbearing or burdensome support) are more consistently related to decreased fluid cognitive

abilities, such as executive functioning and working memory, than to crystalized abilities like verbal memory and vocabulary (Sims et al., 2014). Other studies, in contrast, suggest that cognitive aging is generally not domain-specific and declines across multiple cognitive domains are usually intercorrelated (Lövdén et al., 2020). The current study used only one cognitive task per domain, however, which some researchers have cautioned against (Bielak & Gow, 2023). Moreover, although the conditional effect of ambivalent ties on Trails A-B performance at high levels of engaged coping was statistically significant ($p = .004$), results should be interpreted with caution as the interaction term was marginally significant ($p = .0129$) after the Bonferroni-adjusted threshold ($p < .0125$).

Strengths and Limitations

This study is one of the first, to my knowledge, to examine links between exposure to ambivalent ties and cognitive functioning among older adults. One recent study examining family typologies among U.S. Chinese older adults found that ambivalent typologies (i.e., family networks characterized by high solidarity and high conflict) predicted better cognitive functioning (Li et al., 2021) – which contrasts with the current findings. Extrapolation of Li and colleagues' results to ambivalent ties is unclear, however, as their assessment method did not allow the authors to decipher whether sources of solidarity and conflict were originating from the same family member(s). Instead, the current study aligns with current theoretical models of linking ambivalent ties to poor physical health and disease outcomes (Holt-Lunstad & Uchino, 2019), and suggests these associations may extend to cognitive health.

This study has limitations that should be carefully considered. Importantly, reverse causation cannot be ruled out due to the cross-sectional nature of the data. Given that certain late-life contexts are prone to generating ambivalent ties, such as dementia family caregiving

(Losada et al., 2017), it is possible that older adults with poorer cognitive functioning require more assistance from family members, perhaps contributing to a stressful environment with higher likelihood that ties will be classified as ambivalent. The current sample included only cognitively normal older adults (individuals exhibiting cognitive impairment were not eligible), making it unlikely that relatively poorer cognitive functioning would not be so extreme as to require specialized or intensive caregiving. However, the possibility cannot be discounted.

Another limitation was that the interpersonal coping scales did not explicitly assess coping with ambivalent ties per se. The coping measure asked participants indicate how they respond to negative exchanges with "people they feel close to and care about." Ambivalent ties were operationalized as people whom participants had identified as close and important, and who were sources of both positive and negative exchanges. Thus, the coping scale presumably captured participants' coping responses to exchanges with ambivalent ties, but this assumption cannot be verified.

Conclusion

Overall, study findings suggest that ambivalent ties are related to poor cognitive functioning, and that this association is not easily buffered by interpersonal coping efforts. In fact, more effortful or benevolent coping strategies may exacerbate the adverse cognitive associations, at least with respect to some domains of cognitive functioning (e.g., fluid abilities), but further investigation is needed to decipher potential mechanisms. Ambivalent relationships are common across the lifespan and into later life, making it important to understand their influence on all aspects of health – including cognitive functioning.

Table 2.1

Descriptive Information and Correlations Among Study Variables

Variable	*M* (*SD*)	1	2	3	4	5	6	7	8	9	10
Covariates											
1. Age	73.49 (6.32)	--									
2. Sex	--	-.00	--								
3. Education	6.03 (1.51)	-.01	.18**	--							
4. Race/ethnicity	--	-.18**	.05	-.28***	--						
5. Marital status	--	-.24***	.41***	.15*	-.02	--					
6. Health conditions	2.31 (1.48)	.29***	-.12†	-.25***	.05	-.19**	--				
Focal Predictor											
7. Ambivalent ties ratio	0.39 (0.26)	-.06	.20**	-.16**	.23***	.11†	.10†	--			
Coping Strategies											
8. Engaged	3.57 (0.72)	-.12*	-.03	-.00	.02	.03	-.05	-.11†	--		
9. Avoidant	2.74 (0.76)	.05	-.13*	-.00	-.17**	-.09	.07	.02	-.49***	--	
10. Destructive	2.01 (0.84)	-.12†	.07	-.01	-.00	.31***	-.01	.11†	-.09	.03	
Cognitive Outcome											
11. Overall composite	0.00 (0.67)	-.10	-.02	.44***	-.41***	.17**	-.12†	-.29***	.01	.08	.00

Note. N = 271. Sex (0 = *female*, 1 = *male*). Education (1 = *no formal education* to 8 = *advanced degree*). Race/ethnicity (0 = *non-Hispanic White*, 1 = *Hispanic/Latino, Black/African American, or mixed/other*). Marital status (0 = *not married*, 1 = *married or living with partner*). Health conditions (0 to 8 chronic conditions).

$^{\dagger}p < .10$. $*p < .05$. $**p < .01$. $***p < .001$.

Table 2.2

Overall Cognitive Functioning Regressed on Ambivalent Ties and Interpersonal Coping Strategies

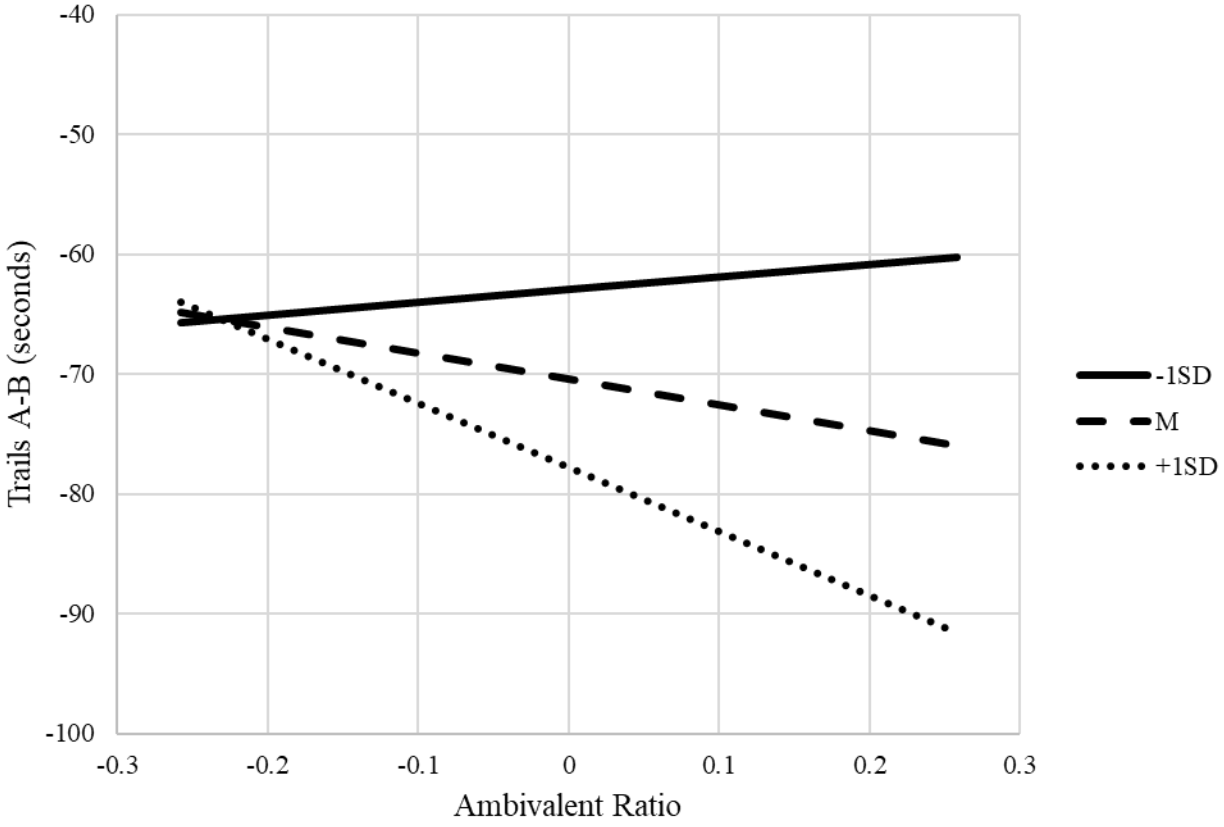
	Engaged Coping			Avoidant Coping			Destructive Coping		
Variable	*b* (*SE*)	95% CI_b	β	*b* (*SE*)	95% CI_b	β	*b* (*SE*)	95% CI_b	β
Constant	.21 (.46)	-0.73, 1.18		.17 (.45)	-0.74, 1.13		.13 (.45)	-0.79, 1.10	
Age	-.02 (.01)*	-0.03, -0.00	-.14	-.02 (.01)*	-0.03, -0.00	-.14	-.01 (.01)*	-0.03, -0.00	-.14
Sex	-.11 (.08)	-0.26, 0.03	-.09	-.11 (.08)	-0.26, 0.04	-.08	-.12 (.08)	-0.27, 0.03	-.09
Education	.15 (.02)***	0.10, 0.20	.33	.15 (.02)***	0.10, 0.20	.33	.15 (.02)***	0.10, 0.20	.33
Race/ethnicity	-.44 (.08)***	-0.63, -0.25	-.30	-.43 (.08)***	-0.63, -0.24	-.29	-.43 (.08)***	-0.63, -0.25	-.29
Marital status	.20 (.08)*	0.04, 0.35	.14	.20 (.08)*	0.04, 0.35	.15	.03 (08)**	0.07, 0.39	.17
Health conditions	.02 (.03)	-0.03, 0.08	.05	.03 (.03)	-0.03, 0.08	.05	.03 (.03)	-0.03, .08	.06
Ambivalent ties ratio	-.48 (.14)***	-0.78, -0.16	-.19	-.49 (.14)***	-0.78, -0.17	-.19	-.46 (.14)***	-0.76, -0.15	-.18
Coping strategy	-.02 (.05)	-0.12, 0.08	-.02	.04 (.05)	-0.05, 0.13	.04	-.04 (.04)	-0.12, 0.04	-.05
Interaction term	-.02 (.21)	-0.46, 0.48	-.00	.16 (.18)	-0.28, 0.53	.04	.25 (.16)	-0.13, 0.59	.08

Note. $N = 271$. Each panel shows results from separate models where overall cognitive functioning was regressed on ambivalent ties ratio, one of the three coping strategies (engaged, avoidant, or destructive), and the interaction between ambivalent ties ratio and the corresponding coping strategy, along with the covariates. CI_b = bootstrapped confidence interval for unstandardized regression coefficient (*b*). β = standardized beta coefficient.

*$p < .05$. **$p < .01$. ***$p < .001$.

Figure 2.1

Interaction of Ambivalent Ties Ratio and Engaged Coping on Performance on the Trail Making Test



Note. N = 271. This figure shows the association between ambivalent ties ratio and cognitive performance at three levels of the moderator (engaged coping). Trails A-B = Trail Making Test difference (in seconds) between Trails A-B (higher scores indicate better performance).

STUDY 3

Ambivalent Ties and Daily Health Limitations

Relationships in which positive and negative exchanges co-occur, referred to as ambivalent social ties, are often detrimental to physical health and well-being. The Social Ambivalence and Disease (SAD) model posits that greater exposure to these ties (e.g., numerous or frequent interactions) allows ample opportunity for these ties to impact health (Holt-Lunstad & Uchino, 2019). Yet, the majority of evidence has been derived from between-person differences, with few studies examining the impact of within-person fluctuations in exposure to ambivalent ties in daily life. Greater exposure is defined in the current study as the extent to which ambivalent ties comprise the bulk of one's daily social interactions. Although the SAD model argues that ambivalent ties pose health risks, conflicting evidence suggests that such ties are not always harmful (e.g., Girardin et al., 2018; Lincoln et al., 2019). Adding further paradox, ambivalent emotions more broadly have been related to salutary health effects (Hershfield et al., 2013). The current study sought to address these inconsistent findings by examining the daily coupling of exposure to ambivalent ties and health and whether individuals' appraisals of ambivalent affect might moderate this link.

Given that ambivalent ties are commonly close ties, such as family members or lifelong friends, evidence suggests that people do not avoid these ties and often maintain the relationships voluntarily through frequent contact (Bushman & Holt-Lunstad, 2009; Campo et al., 2009). Researchers have argued that even minimal contact (e.g., being in the same room but not conversing with an ambivalent tie) is harmful. A series of laboratory studies among undergraduate college students demonstrated that the mere presence or anticipation of contact with an ambivalent (vs. non-ambivalent) friend was associated with increased anxiety and

dysregulated cardiovascular functioning (Holt-Lunstad & Clark, 2014; Holt-Lunstad et al., 2007). This heightened physiological response was also evident while interacting with the ambivalent friend during a stressor task, as well as during the post-task recovery period. In these experimental studies, however, the composition of participants' daily social interactions – such as who else they saw before or after the experiment – is not typically considered. Given that supportive social exchanges can have buffering effects (e.g., Cohen & Wills, 1985), the broader context of participant's social exchanges surrounding the stressful (lab-designed) encounter may be important to consider. An important unanswered question is whether exposure to ambivalent ties, relative to encounters with non-ambivalent ties, is associated with physical well-being. Examining these factors on a daily level is important for understanding within-person fluctuations over time, providing critical insight into the development of broader health and disease outcomes (see review by Charles et al., 2021).

Ambivalent Ties in Daily Life

A few studies have applied experience sampling methods to examine the link between daily interactions with ambivalent ties and physiological health indicators. In a study of young and middle-aged adults (ages 18 to 46) using an event-contingent design, participants were instructed to initiate ambulatory blood pressure readings (by pressing a small, portable monitor button attached to their person) approximately 5 min. into each social interaction over a 3-day period (Holt-Lunstad et al., 2003). Results showed that blood pressure was higher during interactions with ambivalent ties than with positive or negative ties. Another study of married couples (ages 18 to 63), in which ambulatory blood pressure readings occurred randomly every 30 min. across one day, showed that

participants with an ambivalent (vs. supportive) spouse exhibited higher blood pressure throughout the day (Birmingham et al., 2015). Notably, this link was not attributable to overall levels of spousal negativity, suggesting something unique about the ambivalent nature of the relationship. Moreover, their findings held regardless of whether participants were with their spouse at the time of the reading, suggesting that daily exposure to ambivalent ties may have lingering and pervasive effects even when the tie is not physically present.

These previous studies have yielded critical insights into the physiological effects of ambivalent ties in daily life yet are limited by several factors. Importantly, these studies did not include older age groups. Older adults' physiological and emotional reactivity to interpersonal stressors have been shown to differ from that of their younger counterparts (e.g., Birditt & Fingerman, 2003; Charles, 2010). Additionally, previous study designs have not typically accounted for proportion of ambivalent ties, relative to non-ambivalent ties, encountered each day. Given that the harmful effects of ambivalent ties persist beyond their physical presence (Birmingham et al., 2015; Holt-Lunstad & Clark, 2014), it is important to examine the social composition of one's entire day. Daily social lives unfold in a myriad of contexts, and social interactions do not occur as isolated events. Taking a more contextual approach may provide additional clarification about how ambivalent ties operate to influence health in daily life. A day filled with ambivalent ties would presumably be more deleterious than a day only sprinkled with ambivalent ties amidst other ties. Finally, it is unclear whether momentary physiological reactivity to ambivalent ties (e.g., blood pressure spikes) observed in previous studies might translate to noticeable health problems that interfere with everyday functioning. Accordingly, the first aim of this study is to examine whether greater exposure to ambivalent ties is related to poorer daily health limitations among older adults.

Despite the bulk of evidence suggesting that ambivalent ties are adversely related to physical health, a few recent studies have found the opposite. One study showed that older adults with ambivalent extended kin networks exhibited better physiological profiles (longer telomeres) than did older adults with only supportive extended kin networks (Lincoln et al., 2019). Another study found that older adults with family networks characterized by high support and high conflict exhibited good functional health (Girardin et al., 2018). These researchers, among others (e.g., Pillemer et al., 2019), have posited that ambivalence is a normative experience in close relationships and may even reflect intimacy and ability to express one's true thoughts and feelings. Research from affective sciences suggests that co-occurring positive and negative affect (i.e., ambivalent affect) is indeed associated with better physical health, particularly as people age (Hershfield et al., 2013). These findings are paradoxical, given that the SAD model (which links ambivalent ties to poor physical health; Holt-Lunstad & Uchino, 2019) defines ambivalent ties as relationships that engender mix of positive and negative feelings.

Valuation of Ambivalent Affect

Because ambivalent ties are typically close and important, researchers have posited that the value placed on these relationships exacerbates their harmful effects because individuals may take negative exchanges more personally and be less inclined to avoid (or end) the relationship (Bushman & Holt-Lunstad, 2009; Holt-Lunstad & Uchino, 2019). Valuing an ambivalent tie does not necessarily imply that individuals value the ambivalent feelings elicited by these ties, however, although some may find value in such emotions. The idea that people differ in the extent to which they ascribe value to different

emotions (i.e., appraising positive and negative feelings as pleasant, useful, appropriate, or meaningful) is referred to as positive and negative affect valuation (Luong et al., 2016).

Although negative emotions are generally considered "bad," emerging evidence suggests that people differ in the extent to which they find value in such emotions. Sadness might be viewed as cathartic following the loss of a loved one, and anger might serve to empower an individual responding to social injustice. Rooted in affect appraisal theories, a person's valuation of emotional cues can alter their physiological and experiential response to that situation (Gross et al., 1998; Luong et al., 2016). For instance, a person who places low value on affective experiences such as anger might appraise social tensions as disruptive and undesirable. In contrast, a person who places high value on anger might appraise that same situation as useful and constructive. According to appraisal theories, the latter person would be expected to exhibit a more adaptive physiological response to that particular emotional cue (i.e., social tension).

Findings from a novel study using ecological momentary assessments among a lifespan sample (ages 14 to 88) supported this latter idea (Luong et al., 2016). The findings showed that greater negative affect valuation attenuated (or in some cases erased) the adverse impacts of daily negative affect on daily physical well-being. This study did not assess the source of daily affect, however, so it is unclear whether this finding would extend to social interactions, specifically. Additionally, researchers have not yet considered whether valuing both positive and negative affect to similarly high degrees, referred to in the current study as *ambivalent affect valuation,* could moderate the health associations of ambivalent social interactions.

To address these gaps, the current study examined the following hypotheses:

- *Hypothesis 1* (*H1*): Greater daily exposure to ambivalent ties will be associated with poorer daily health among older adults.

- *Hypothesis 2* (*H2*): Older adults with greater ambivalent affect valuation will exhibit attenuated links between greater daily exposure to ambivalent ties and poorer daily health.

Method

Participants and Procedures

Data were collected in 2016-2017 as part of the Daily Experiences and Well-being Study (DEWS; Karen L. Fingerman, Principal Investigator), a study of community-dwelling older adults in the greater Austin, Texas area. Eligibility criteria and recruitment details are presented in Study 1. The initial baseline sample included 333 older adults (ages 65-92 years old, 55% female, 67% non-Hispanic White).

The baseline in-person interview assessed information about participants' social network ties and sociodemographic characteristics. After the interview concluded, the interviewer provided a self-administered questionnaire (SAQ) that included questions about affect valuation, along with a pre-paid envelope for participants to return the completed SAQ by mail. Of the 333 adults who completed the in-person interview, 324 participants completed the SAQ. At the end of the baseline visit, the interviewer also provided the participant with an Android mobile phone and instructed them on how to use the device to respond to ecological momentary assessment (EMA) surveys that were scheduled to occur at the start of each day, every 3 hours while awake, and at the end of each day for 5-6 days. Survey prompts were scheduled on the Android device for each participant based on their typical wake-up and bedtime. The start-of-day surveys (at waking) did not include social interaction measures and were omitted from current analyses. After waking, the social interaction measures were assessed every 3 hours until

bedtime. The physical health measure was assessed once per day at bedtime. Of the initial baseline sample, 313 adults participated in the daily assessments.[5] Participants received $50 after completing the baseline interview and an additional $100 after completing the EMA data collection. All study procedures were approved by the Institutional Review Boards at the University of Texas at Austin (Title: Daily Experiences and Well-Being; Protocol No. 2015-02-0123).

Missing Data and Exclusions

To be included in analyses for the current study, participants needed to have responded to items assessing health limitations and social interaction partners on at least two of the days. Of the 313 adults who participated in the daily assessments, 270 participants responded to these items on at least two days. Eighty-eight percent of these participants had some days with incomplete responses, however, totaling 361 days that were excluded due to missing data. Participants with at least two complete days (n = 270) and participants with less than two complete days (n = 43) did not differ on any key study constructs at baseline, including number of ambivalent ties, ambivalent affect valuation, and health limitations.

Days during which participants reported no social contacts (i.e., solitude days) were also excluded from analyses, given the current study's focus on daily exposure to ambivalent vs. non-ambivalent ties (rather than vs. no ties). Whether contact with irritating or demanding social ties is better than no contact at all is an interesting question that has been previously examined with this dataset (Birditt et al., 2019). For the current analyses, seven additional days (across six participants) were excluded for being solitude days. These six participants provided at least two

[5] Six participants declined to participate in the daily assessments, one participant deceased, and 13 participants agreed but never completed any daily assessments.

days of sufficient data even after excluding their solitude day(s), and thus were retained in analyses.

Additionally, participants with insufficient social convoy data at baseline (see Study 1 for details) were necessarily excluded from analyses, given that the social convoy data were needed to determine the ambivalent status of each tie encountered throughout the day. Finally, participants missing affect valuation scores were also excluded. Twenty additional participants were excluded due to missing data on these baseline measures. Compared to excluded participants (n = 63), included participants were more likely to be younger ($t(311) = 2.53$, $p = .01$), non-Hispanic White ($\chi^2 = 3.90$, $p = .048$), and report higher levels of education ($t(80.42) = -2.23$, $p = .03$).[6]

Final Sample

The final analytic sample included 1,048 days across 250 older adults (range = 2-6 days per participant, M = 4.19 days, SD = 0.99). Most of these participants (76%) completed 4-5 days that were included in analyses, with 23% completing two or three days and the remaining 1% completing six days. Included participants were 74 years old on average (SD = 6.20) and 58% held a college degree or higher. Most participants were non-Hispanic White (72%), and the remaining participants identified as Black/African American (13%), both Hispanic and White (12%), another mixed race/ethnicity (2%), Hispanic/Latino only (< 1%), or Asian or American Indian/Alaska Native (< 1%). See Table 3.1 for additional sociodemographic information.

Measures

Daily Exposure to Ambivalent Ties

[6] Degrees of freedom adjusted due to unequal variances in education level across excluded vs. included groups [Levene's Test, $F(311) = 9.39$, $p = .002$].

Daily exposure to ambivalent ties was calculated in two steps. First, during the baseline in-person interview, participants completed a convoy diagram of their social ties (Antonucci, 1986) and responded to questions about the aversiveness and supportiveness of their 10 closest ties (see Study 1 for details). Social ties that were sources of both positivity and negativity (i.e., at least a little aversive and a little supportive) were classified as ambivalent ties.

In the second step, these convoy data were used to determine the ambivalent status of each social tie encountered throughout the day. Every 3 hours while awake, participants were prompted to indicate whether they had interacted with any of their 10 closest ties, selecting from the list of names identified in the baseline interview. Responses were aggregated to the day-level to obtain a list of the social ties that participants had interacted with at least once each day. These responses were necessarily aggregated, given that the outcome variable (health limitations) was assessed only once per day. The proportion of social ties encountered each day that were ambivalent (i.e., *daily ambivalent contact ratio*) was computed as an indicator of levels of exposure to ambivalent ties, relative to the total number of social ties encountered each day.

Daily Health Limitations

At the end of each day, participants received the prompt: "Today, to what extent has your physical health interfered with your normal social activities?" Response options included 1 = *not at all*, 2 = *a little*, 3 = *somewhat*, 4 = *quite a bit*, and 5 = *a great deal*. This single item measure was used to minimize response burden, given the multiple assessments participants were asked to complete each day, and is strongly correlated with the more detailed 10-item measure of specific functional limitations (e.g., lifting, bending, climbing stairs; Ware & Sherbourne, 1992) that was assessed during the baseline in-person interview ($r = .61$, $p < .001$), suggesting that this single item sufficiently captures participants' daily functional health.

Affect Valuation

In the self-administered questionnaire, a 40-item measure assessed four facets of positive and negative affect valuation: pleasantness, utility/helpfulness, appropriateness, and meaningfulness (Luong et al., 2016). Participants were asked to indicate how they feel about experiencing three negative affective states (sad, irritated, nervous) and two positive affective states (proud, calm) with respect to each facet. For each affective state, the item stem began with "How often do experience feeling [AFFECTIVE STATE] as…", followed by 8 items: pleasant, unpleasant (reverse scored), helpful, intrusive (reverse scored), appropriate, unsuitable (reverse scored), meaningful, and pointless (reverse scored). Participants rated each item by circling a number from one to seven where 1 = *almost never* and 7 = *almost always*. Participants completed this questionnaire on their own time and returned it by mail sometime during the study period. Affect valuation is theorized to be relatively stable, however, a limitation is that the timing of when participants completed this measure relative to their EMA assessments is unknown.

Ambivalent Affect Valuation (AAV) was calculated using Griffin's formula (Thompson et al., 1995) where the absolute difference between the positive and negative components is subtracted from their average, $(P+N)/2 - |P-N|$. The Positive Affect Valuation (PAV) subscale was used as the positive component, calculated as the average across items assessing positive affective states ($\alpha = .80$). The Negative Affect Valuation (NAV) subscale was used as the negative component, calculated as the average across items assessing negative affective states ($\alpha = .86$). Because resulting scores ranged from -2.00 to 6.14, a constant of 2.50 was added to prevent negative values (cf. Fingerman et al., 2006; Thompson et al., 1995). This formula captures the extent of similarity and intensity of positive and negative ratings, such that a person with similarly high ratings on both PAV and NAV subscales would receive a higher AAV score

than would a person with similarly low ratings on both subscales. Greater discrepancies between the two subscales (e.g., high PAV, low NAV) yields lower AAV scores. This formula is widely used in studies of ambivalent feelings in social relationship contexts (Fingerman et al., 2006; Gilligan et al., 2015; Willson et al., 2006), making it well-suited for application to the construct of affect valuation. In the current sample, AAV scores ranged from 0.50 to 8.64, with higher scores indicating greater ambivalent affect valuation.

Covariates

All analyses adjusted for person-level covariates commonly controlled for in the literature and known to be predictive of health limitations in later life. Covariates treated as continuous included age and education (1 = *no formal education*, 2 = *elementary school*, 3 = *some high school*, 4 = *high school*, 5 = *vocational*/*some college*, 6 = *college degree*, 7 = *some graduate work*, and 8 = *advanced degree*). Covariates treated as dichotomous included sex (0 = *female*, 1 = *male*), race/ethnicity (0 = *non-Hispanic White*, 1 = *Hispanic/Latino, Black/African American, or mixed/other*), and marital status (0 = *not married*, 1 = *married or living with partner*).

Analytic Plan

Descriptive statistics for all study variables were conducted, including frequencies, means, standard deviations, and bivariate correlations. Intraclass correlation coefficients for day-level variables were obtained by entering each variable (ambivalent contact ratio, health limitations) as an outcome in separate unconditional models with no predictors to determine the proportion of explainable variance due to between- vs. within-person differences. Visual assessments, including spaghetti plots and person-by-person time slopes (i.e., by day), revealed no visible outliers and good variability across days.

To examine primary study hypotheses, two-level models were conducted using SAS PROC MIXED (Version 9.4) to account for the nested data structure (i.e., days nested within persons). An initial model regressed daily health limitations on daily ambivalent contact ratio, adjusting for person-level covariates (age, sex, race/ethnicity, and marital status). To separate between- and within-person sources of variance, daily ambivalent contact ratio was person-mean centered (which removes all between-person variance to facilitate within-person comparisons) and each participant's average ambivalent contact ratio (i.e., person-mean across days) was included as the person-level predictor. A second model tested the interaction between daily ambivalent contact ratio (person-mean centered) and ambivalent affect valuation (AAV, grand-mean centered), adjusting for person-level covariates and average ambivalent contact ratio (grand-mean centered). In both models, daily ambivalent contact ratio (person-mean centered) was also specified as a random effect to allow for between-person variation in the extent to which day-to-day fluctuations in exposure to ambivalent ties is associated with day-to-day fluctuations in health limitations (i.e., allowing individual slopes to vary). Significant interactions were probed using SAS PROC PLM to test the conditional slopes of daily ambivalent contact ratio at low (-1 *SD*), average (*M*), and high (+1 *SD*) levels of the moderator (AAV).

As an indicator of effect size, pseudo-R^2 was calculated to represent the proportion of additional explainable random variance explained by models including more predictors, compared to models with fewer predictors, (random variance$_{fewer}$ – random variance$_{more}$) / random variance$_{fewer}$ (Hoffman, 2015; Singer, 1998). To facilitate cross-level comparisons of fixed effects, estimates for continuous predictors were pseudo-standardized by multiplying each estimate (γ) by the standard deviation of the corresponding predictor variable and dividing that

product by the square-root of the matching random variance estimate (Hoffman, 2015). Person-level fixed effects were standardized using the random intercept variance $\left[\left(\gamma_{X_{level\ 2}} * SD_{X_{level\ 2}}\right) / \sqrt{\tau_{u0}^2}\right]$. Day-level fixed effects were standardized using the residual variance $\left[\left(\gamma_{X_{level\ 1}} * SD_{X_{level\ 1}}\right) / \sqrt{\sigma_e^2}\right]$.

Results

Descriptive Information

Means, standard deviations, and observed ranges for key study variables are presented in Table 3.1. Correlations among study variables at the person-level are presented in Table 3.2. Participants reported some level of health limitations (i.e., at least "a little") on about a third (35%) of days. Intraclass correlations (ICCs) revealed that 67% of the variance in daily health limitations was due to between-person differences in their average level of health limitations, with the remaining 33% due to daily fluctuations within-persons.

Descriptive Analyses of Ambivalent Contact Ratio

Exposure to ambivalent ties was generally high, with ambivalent ties comprising, on average, 72% of the social ties that older adults encountered each day (see Table 3.1). Participants reported interacting with only ambivalent ties (i.e., 100% of their social encounters were with ambivalent ties) on approximately half (52%) of days. Conversely, participants reported having no contact with ambivalent ties on 12% of days. ICCs revealed that 61% of the variance in daily ambivalent contact ratio was due to between-person differences, with 39% due to within-person fluctuation. In terms of within-person fluctuation, frequency distributions for the person-mean centered daily ambivalent contact ratio showed that older adults experienced their usual (or mean) levels of exposure to ambivalent ties on 35% of days, less than usual on 31% of days, and more than usual on 34% of days (*SD* = .19).

Interestingly, participants with higher mean levels of exposure to ambivalent ties (i.e., higher average ambivalent contact ratio) also reported higher ambivalent affect valuation (r = .13, p = .045; see Table 3.2). Exposure to ambivalent ties was also higher among participants who were younger (r = -.13, p = .043), male [t(244.15) = -4.28, p < .001], married or partnered [t(186.36) = -5.06, p < .001],[7] and identified as belonging to a racially or ethnically marginalized group [i.e., Hispanic/Latino, Black/African American, or mixed/other; t(248) = -2.79, p = .006].

Descriptive Analyses of Ambivalent Affect Valuation

Ambivalent affect valuation (AAV) was higher among older adults who reported lower levels of education (r = -.26, p < .001; see Table 3.2) and among those who identified as belonging to a racially or ethnically marginalized group [t(248) = -5.69, p < .001]. AAV was not associated with age, sex, or marital status. Correlations among the positive and negative affect valuation subscales used to compute AAV are presented in Table 3.2.

Is Daily Exposure to Ambivalent Ties Linked to Daily Health Limitations?

Results from the first model examining whether daily exposure to ambivalent ties (i.e., ambivalent contact ratio) was related to daily health limitations are presented in Table 3.3 (first panel). At the person-level, higher average ambivalent contact ratio was related to worse health limitations (γ = 0.61, SE = 0.19, t(243) = 3.15, p = .002). At the day-level, however, within-person fluctuation in daily ambivalent contact ratio was unrelated to daily health limitations (γ = -0.10, SE = 0.11, t(797) = -0.90, p = .37). As an indicator of effect size, pseudo-R^2 calculations revealed that the overall model explained 4% of the explainable random intercept variance (or between-person differences) in average health limitations and 6% of the explainable residual

[7] Degrees of freedom corrected for unequal group variances based on Levene's Test: male vs. female (F(248) = 4.70, p = .03); married vs. unmarried (F(248) = 4.69, p = .03).

variance (or within-person fluctuation) in daily health limitations, compared to an unconditional model with no predictors.

Does Ambivalent Affect Valuation Moderate the Link Between Daily Exposure to Ambivalent Ties to Health Limitations?

The second model included ambivalent affect valuation (AAV, grand-mean centered) and the interaction between AAV and daily ambivalent contact ratio (person-mean centered). Results are presented in Table 3.3 (second panel). At the person-level, higher average ambivalent contact ratio was again related to worse health limitations ($\gamma = 0.61$, $SE = 0.19$, $t(242) = 3.17$, $p = .002$). At the day-level, the association between daily ambivalent contact ratio and daily health limitations was significantly moderated by AAV ($\gamma = -0.18$, $SE = 0.08$, $t(796) = -2.32$, $p = .02$). Plots of the interaction are presented in Figure 3.1. Consistent with the hypothesis, higher daily ambivalent contact ratio was related to lower health limitations among participants with relatively high (+1 *SD*) levels of AAV ($\gamma = -0.38$, $SE = 0.16$, $t(796) = -2.37$, $p = .02$). Conversely, among participants with relatively low (-1 *SD*) and average levels of AAV, the link between daily ambivalent contact ratio and daily health limitations was in the expected direction (i.e., higher ambivalent contact ratio, worse health limitations) but did not reach statistical significance (low AAV: $\gamma = 0.15$, $SE = 0.15$, $t(796) = 1.02$, $p = .31$; mean AAV: $\gamma = -0.11$, $SE = 0.10$, $t(796) = -1.08$, $p = .28$).

Pseudo-R^2 for the random slope variance revealed that including AAV and the interaction term explained an additional 16% of the explainable between-person variation in the ambivalent contact ratio slope, compared to the first model (see Table 3.3). Pseudo-R^2 for the random intercept and residual variances revealed that this model explained the same amount of between- and within-person variation in health limitations (4% and 6%, respectively) as the first model,

when compared to an unconditional model with no predictors. These effect sizes contrast with those of previous study examining the role of negative affect valuation (NAV) in moderating daily affect-health links (Luong et al., 2016), in which the proportion of additional explainable between-person variation in daily health was primarily explained by the main effects (approx. 21%) rather than the interaction term (approx. 3%).

Sensitivity Analyses

Additional models examined whether the moderating effects of AAV were driven by either positive or negative affect valuation. In separate multilevel models, AAV was replaced with either NAV or PAV (each grand-mean centered) to test whether NAV or PAV moderate the association between daily ambivalent contact ratio and daily health limitations. Given that ambivalent and negative affect valuation were strongly correlated ($r = .96$, $p < .001$), the moderating effects of NAV were expected to mirror those of AAV. Indeed, results revealed a significant interaction effect of NAV ($\gamma = -0.30$, $SE = 0.12$, $t(796) = -2.45$, $p = .01$), such that higher daily ambivalent contact ratio was linked to lower health limitations among participants with relatively high (+1 *SD*) levels of NAV ($\gamma = -0.39$, $SE = 0.16$, $t(796) = -2.47$, $p = .01$). This link was again non-significant among participants with relatively low (-1 *SD*) and average levels of NAV ($ps > .05$). In a separate model examining PAV, the interaction between PAV and daily ambivalent contact ratio was non-significant ($p > .05$).

Discussion

Many studies have demonstrated that ambivalent social ties are detrimental to numerous facets of health and wellbeing (for reviews see Holt-Lunstad & Uchino, 2019; Ross et al., 2019), but conflicting findings from a few recent studies suggest that this link may not be so straight forward (Brown & Rook, 2022; Girardin et al., 2018; Lincoln et al., 2019). Paradoxically, further

evidence suggests that ambivalent affect (broadly construed as the co-occurrence of positive and negative emotions) is associated with better health outcomes, particularly among older adults (Hershfield et al., 2013). One possible reason for these contradictory findings could be that people differ in the extent to which they value ambivalent affect (i.e., appraising both positive and negative feelings as pleasant, useful, appropriate, or meaningful to similarly high degrees). Theoretical models of affect appraisal and empirical studies indeed suggest that a person's affect valuation can alter how they are impacted by emotional cues (Gross et al., 1998; Luong et al., 2016, 2023), but these phenomena have not been tested with regard to ambivalent social encounters. The current study accordingly sought to examine whether the link between ambivalent ties and health is moderated by individuals' valuation of ambivalent affect using ecological momentary assessments (EMA) among a sample of older adults.

Results generally supported the hypothesis that older adults with higher levels of ambivalent affect valuation (AAV) exhibit attenuated links between daily exposure to ambivalent ties and poorer daily health. Notably, findings showed that AAV not only attenuated, but reversed this link. For older adults with relatively high AAV, on days when exposure to ambivalent ties was higher than usual, they reported better health (i.e., lower health limitations) than usual. For older adults with relatively low or average AAV, daily exposure to ambivalent ties was not significantly related to daily health, although the association was in the opposing direction (i.e., greater exposure, worse health). Sensitivity analyses of negative affect valuation (NAV), however, revealed an identical pattern of results, indicating that these moderating effects were not unique to AAV.

Because AAV and NAV were nearly identical constructs in the current sample, I could not empirically evaluate whether the valuation of ambivalent vs. negative affect exhibit any

unique moderating roles. It seems likely, however, that the moderating effects found in the current study were due to individual difference in NAV, rather than AAV per se. Generally, people value positive affect more than they value negative affect (Luong et al., 2016). Therefore, higher AAV scores could have been driven by higher NAV scores (resulting in PAV and NAV ratings becoming more similar).

This finding makes sense in view of the Social Ambivalent and Disease (SAD) model which poses that ambivalent ties are associated with greater interpersonal stress and influence health outcomes, in part, through this stress-enhancement (Holt-Lunstad & Uchino, 2019). Moreover, previous work also suggests that negative social exchanges more strongly predict health and wellbeing outcomes than do positive exchanges (Baumeister et al., 2001; Newsom et al., 2005). Taken together, the ambivalent ties-health link may be driven by the negative affect (rather than ambivalent affect per se) elicited by these ties, which could explain why NAV moderates this link. The current study did not directly measure older adults' emotional reactivity to specific social encounters, but this would be important to examine in future studies.

Potential Mechanisms Linking Affect Valuation and Exposure to Ambivalent Ties

Why might AAV/NAV benefit and not just attenuate the adverse ambivalent ties-health link? Studies emerging from affect valuation theory suggest that when people experience the emotions they want to feel (i.e., when ideal affect aligns with actual affect), they exhibit better health and well-being (Tsai, 2017). Ideal affect differs from valued affect, but they are related in the sense that people's ideal affect (the emotions they prefer or desire to feel) shapes the types of emotions that they value (or find pleasant/meaningful), and subsequently influences their behavior and types of experiences they seek out (Luong et al., 2016; Tsai, 2017). Accordingly, it is possible that the older adults in the current sample who placed higher value on ambivalent and

negative affect, did so because such values align with their ideal affect. When their lived experiences, in turn, align with those values and ideals (i.e., valuing ambivalence and experiencing ambivalence), it may explain why they reported better health on those days.

This idea is partially supported by the strong correlation between higher AAV and higher ambivalent contact ratio observed in our study, suggesting that participants who valued ambivalent affect indeed had greater exposure to ambivalent ties. One possible explanation, as noted previously, is that people who value ambivalent affect do not as readily avoid ambivalent situations (aligned with affect valuation theory; Tsai, 2017). Alternatively, individuals who are more surrounded by ambivalent ties in their day-to-day lives may have developed a more accepting attitude toward such ties and the ambivalent (or negative) emotions they elicit. Indeed, some evidence suggests that older adults are more likely to forgive or find compromise when conflicts arise in ambivalent relationships (Rook et al., 2012); and greater acceptance of negative feelings toward ambivalent ties is associated with lower blood pressure (assessed among dementia family caregivers; Losada et al., 2014). Such coping responses may offer relief from the need to suppress negative emotions, and instead give oneself permission to feel upset when conflict arises. These potential mechanisms were not assessed in the current study, but future investigation of the role of acceptance and forgiveness in ambivalent relationships may shed light on the current findings.

Deciphering Daily vs. Overall Exposure to Ambivalent Ties

Unexpectedly, the main effects model showed that greater exposure to ambivalent ties was significantly related to worse health limitations at the person-level only (i.e., between-person differences in average ambivalent contact ratio) but non-significant at the day-level (i.e., within-person fluctuations in daily ambivalent contact ratio). Perhaps the daily or momentary effects of

ambivalent ties are more subtle or "beneath the surface", such as increased blood pressure and dysregulated cardiovascular functioning (Birmingham et al., 2015; Holt-Lunstad et al., 2003; Holt-Lunstad & Clark, 2014), that may accumulate over time to impart broader health and disease consequences. It is also possible that interaction term, at the day-level, in the current study could have introduced a suppression effect. In other words, daily exposure to ambivalent ties may only matter for daily health limitations when taking AAV (or NAV) into account.

Because daily ambivalent contact ratio was person mean-centered, it represented the extent to which individuals deviated from their average levels of ambivalent exposure. In other words, higher scores represent days on which participants experienced greater than their usual levels of exposure, whereas lower scores represent less than usual exposure. Existing literature on ambivalent ties is largely drawn from studies of between-person differences (e.g., people with more vs. fewer ambivalent ties their overall social network), which does not capture within-person fluctuation in levels of interacting with ambivalent ties. A handful of studies examined this link on a daily level. However, these studies focused either on a specific role relationship (e.g., spousal ambivalence; Birmingham et al., 2015) or examined social interactions as discreet occurrences (i.e., interacting with an ambivalent vs. supportive vs. conflictual tie; Holt-Lunstad et al., 2003). Moreover, these studies have not often included older age groups (over 65 years old), which may account for the different findings in the current study.

Limitations and Future Directions

The current study has limitations that should be considered when interpreting these findings. First, reverse causation cannot be ruled out. It is possible that participants were more socially active on days when they experienced better health and therefore encountered more ambivalent ties. If so, however, this link would have presumably been observed at all levels of

AAV (rather than only high AAV), making a simple reverse causation explanation unlikely. Moreover, because exposure was computed as the ratio (rather than total number) of ambivalent contacts, this measure accounts for the sheer number of ties encountered each day, helping to rule out the potentially confounding influence of overall social activity.

Another important limitation is that the affect valuation measure assessed only low arousal positive emotions (calm, proud). Given that desire for high arousal positive states tends to remain stable into older age among (at least among European Americans, who comprised the majority of the current sample; Tsai & Sims, 2016), it may be important to evaluate older adults' valuation of high arousal positive emotions as well. The discrepancy between positive and negative valuations (and therefore AAV scores) may widen in measures assessing higher arousal positive emotions (e.g. joy, happy) and/or negative emotions known to be less common (and perhaps less valued) as people age (e.g., anger; Birditt & Fingerman, 2003).

Finally, participants excluded due to missing data were older, reported lower education, and were more likely to identify as belonging to a racial/ethnically marginalized group. Because affect valuation and its health implications differ cross-culturally (Yoo & Miyamoto, 2018), future studies including samples with more racial/ethnic and cultural diversity will be important for understanding the external validity and applicability of current findings to a broader range of older adults.

Conclusion

The current study extends previous work by examining the daily coupling of exposure to ambivalent ties and health limitations among older adults. Findings suggest that the accumulation of exposure to ambivalent ties is associated with poorer heath limitations overall, but that the effects of daily exposure may be buffered by one's valuation of ambivalent and/or

negative affect. This study sheds light on the ways in which these processes unfold in everyday life, providing avenues to inform interventions that operate in older adults' daily and momentary experiences. Findings bolster the evidence that ambivalent ties influence health in unique and complex ways, pointing to the need for more work to gain further insights into the role of affect valuation in reducing or amplifying the adverse health effects of ambivalent ties.

Table 3.1

Descriptive Information for Study Variables

Variable	*M* or %	*SD*	Range
Day-level variables			
Ambivalent contact ratio	0.72	0.30	0-1
Health limitations	1.61	0.85	1-5
Person-level variables			
Ambivalent affect valuation	5.27	1.45	0.50-8.64
Negative affect valuation	3.77	0.93	1.00-6.29
Positive affect valuation	5.70	0.74	3.65-7.00
Age	73.49	6.20	65-89
Education[a]	6.00	1.48	2-8
% Female[b]	56.00		
% Non-Hispanic White[c]	71.60		
% Married/partnered[d]	60.80		

Note. $N = 250$.

[a]1 = *no formal education*, 2 = *elementary school*, 3 = *some high school*, 4 = *high school*, 5 = *vocational*/*some college*, 6 = *college degree*, 7 = *some graduate work*, 8 = *advanced degree*.

[b]0 = *female*, 1 = *male*.

[c]0 = *non-Hispanic White*, 1 = *Hispanic/Latino, Black/African American, or mixed/other*.

[d]0 = *not married*, 1 = *married or living with partner*.

Table 3.2

Bivariate Correlations Among Study Variables at the Person-Level

Variable	1	2	3	4	5	6	7	8	9
1. Age	--								
2. Sex	.01	--							
3. Education	.05	.16*	--						
4. Race/ethnicity	-.17**	.10	-.30***	--					
5. Marital status	-.21***	.42***	.11†	.02	--				
6. AAV	.09	.04	-.26***	.34***	-.04	--			
7. NAV	.10	-.01	-.23***	.30***	-.07	.96***	--		
8. PAV	-.02	-.12†	.25***	-.25***	-.06	-.37***	-.17**	--	
9. Avg. ambivalent contact ratio	-.13*	.26***	-.12†	.17**	.31***	.13*	.09	-.19**	--
10. Avg. health limitations	.12	-.11†	-.02	-.05	-.05	-.02	-.03	-.03	.14*

Note. N = 250. The person-means of daily ambivalent contact ratio and daily health limitations were used for the person-level correlations shown here. AAV = ambivalent affect valuation. NAV = negative affect valuation. PAV = positive affect valuation. Sex (0 = *female*, 1 = *male*). Education (1 = *no formal education* to 8 = *advanced degree*). Race/ethnicity (0 = *non-Hispanic White*, 1 = *Hispanic/Latino, Black/African American, or mixed/other*). Marital status (0 = *not married*, 1 = *married or living with partner*).

$^{\dagger}p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 3.3

Multilevel Model of Daily Health Limitations Regressed on Daily Ambivalent Contact Ratio and Ambivalent Affect Valuation

	Daily Health Limitations				
	Model 1		Model 2		
Variable	Estimate (*SE*)	95% CI	Estimate (*SE*)	95% CI	Pseudo-Std. Estimate[a]
Fixed effects					
Intercept	-0.08 (0.73)	-1.52, 1.37	0.30 (0.72)	-1.11, 1.71	
Age	0.02 (.01)*	0.00, 0.04	0.02 (0.01)*	0.00, 0.04	
Sex	-0.28 (0.12)*	-0.52, -0.04	-0.28 (0.12)*	-0.52, -0.05	
Education	0.01 (0.04)	-0.07, 0.08	0.00 (0.04)	-0.07, 0.08	
Race/ethnicity	-0.08 (0.13)	-0.33, 0.17	-0.05 (0.13)	-0.31, 0.21	
Marital status	-0.01 (0.13)	-0.26, 0.24	-0.00 (0.13)	-0.25, 0.24	
Avg. ambivalent contact ratio	0.61 (0.19)**	0.23, 0.99	0.61 (0.19)**	0.23, 1.00	0.23
Daily ambivalent contact ratio	-0.10 (0.11)	-0.30, 0.11	-0.11 (0.10)	-0.32, 0.09	-0.04
AAV			-0.02 (0.04)	-0.10, 0.05	-0.04
AAV x Daily ambivalent contact ratio			-0.18 (0.08)*	-0.34, -0.03	
Random effects					Pseudo-R^2
Intercept variance	0.61 (0.06)***		0.61 (0.06)***		.04
Ambivalent contact ratio slope variance	0.36 (0.16)*		0.30 (0.15)*		.16
Residual variance	0.30 (0.02)***		0.30 (0.02)**		.06

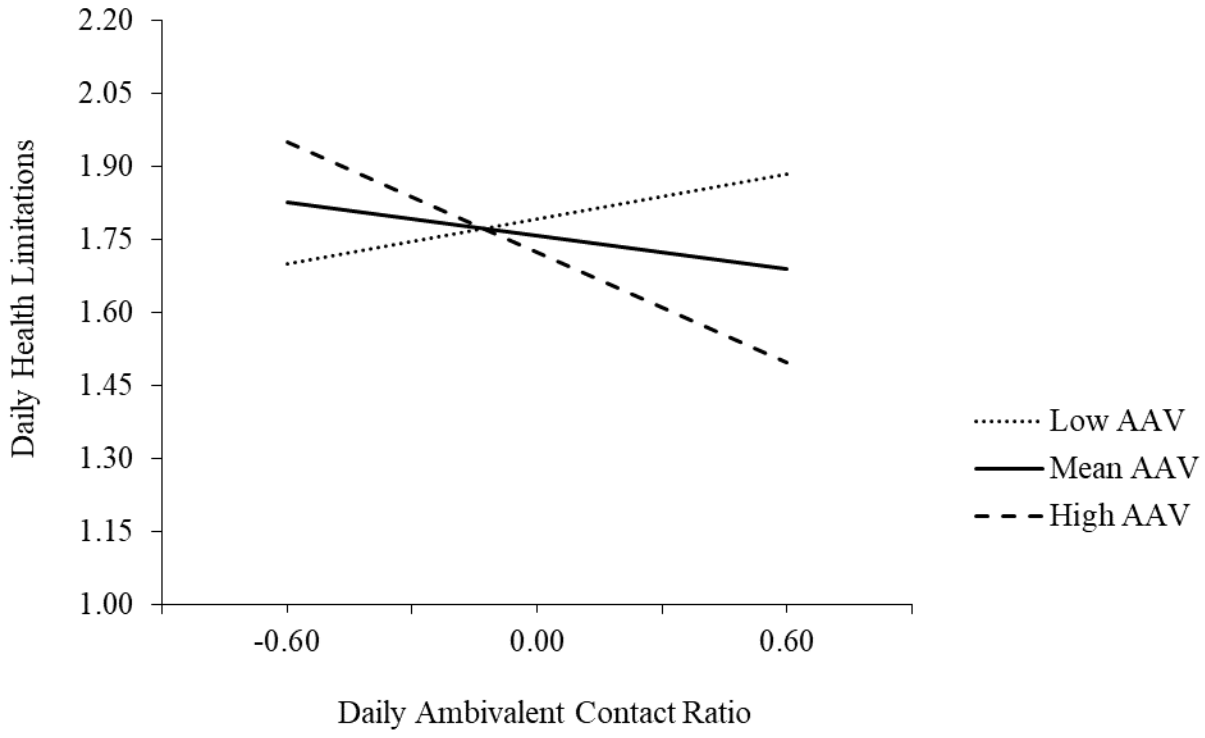
Note. N = 1048 days across 250 participants. AAV = Ambivalent affect valuation.

[a]Pseudo-Std. Estimates and Pseudo-R^2 presented for model 2 only. Pseudo-R^2 (intercept, residual) were compared to an unconditional model with no predictors. Pseudo-R^2 (slope) for model 2 was compared to the random slope variance for model 1.

*p < .05. **p < .01. ***p < .001.

Figure 3.1

Ambivalent Affect Valuation Moderates the Association Between Daily Ambivalent Contact Ratio and Health Limitations



Note. This figure displays the conditional associations between daily ambivalent contact ratio (person-mean centered) and daily health limitations (1 = *not at all* to 5 = *a great deal*) at three levels of ambivalent affect valuation (AAV), adjusting for covariates. Low AAV = -1 *SD*. High AAV = +1 *SD*.

SUMMARY AND CONCLUSION

The primary aims of this dissertation were to: a) examine whether different operationalizations of exposure to ambivalent ties are distinctively related to health outcomes among older adults (Study 1), b) examine the link between exposure to ambivalent ties and cognitive functioning and whether this link was moderated by interpersonal coping (Study 2), and c) examine the daily coupling of exposure to ambivalent ties and health limitations and whether this coupling was moderated by affect valuation (Study 3). These questions were examined among a sample of community-dwelling older adults (ages 65+) in the greater Austin, Texas area. In general, findings revealed that greater exposure to ambivalent ties (operationalized as the proportion of ambivalent ties in one's total social network or as the proportion of ambivalent ties encountered each day) was associated with poorer cognitive functioning and worse health limitations (at the person-level), consistent with the view that ambivalent ties are pervasive and painful for numerous facets of health and wellbeing (Holt-Lunstad & Uchino, 2019). Examination of the daily coupling of ambivalent ties and health limitations, however, revealed that these associations (at the day-level) may be buffered by psychosocial factors – namely, the extent to which older adults value ambivalent and/or negative affect (i.e., appraising these affective states as pleasant, useful, appropriate, and meaningful).

The current work extends previous literature in several ways. Ambivalent ties remain understudied relative to the large body of research on positive/supportive ties vs. aversive/unsupportive ties. Existing studies, thus far, have inconsistently operationalized ambivalent ties, and evidence is mixed regarding the health implications of ambivalent ties. The current studies add to the evidence that ambivalent ties are related to poor health outcomes in a variety of domains, including cognitive functioning, which is a health domain underexamined in

the context of ambivalent ties. The current findings also suggest that, despite some evidence showing ambivalent ties are not always harmful to health (e.g., Lincoln et al., 2019; Girardin et al., 2018), the link between ambivalent ties and poor health appears to be not easily buffered. Older adults' efforts to resolve interpersonal conflict in a constructive manner did not buffer, and may even exacerbate, the link between ambivalent ties and poor cognitive functioning (Study 2). The one promising avenue for shielding against the damage of ambivalent ties may lie within an individual's ability to find value (e.g., usefulness, meaning) in the negative experiences engendered by daily encounters with ambivalent ties (Study 3). Further work is needed to determine whether these buffering effects extend to other areas of physical and emotional health, and whether cultural differences in affect valuation (e.g., Yoo & Miyamoto 2018; Yoo et al., 2022) play a further role in the effects of ambivalent ties on health.

The current studies also help to shed light on prior inconsistencies in the operationalization of ambivalent ties. Based on the current dataset, it was found that the proportion of ambivalent ties may be a useful method for operationalizing exposure to ambivalent ties, as it captures the extent to which a person's network is "saturated" with these stress-exacerbating ties. How researchers operationalize exposure to ambivalent ties, nonetheless, greatly depends on how ambivalent ties are identified. The current study used an indirect approach (asking participants about the separate positive and negative exchanges with their social ties), but other studies suggest that a direct approach (asking participants about simultaneous mixed/conflicting feelings toward their social ties) may be differentially related to health and well-being (Suitor et al., 2011). Moreover, the types of positive and negative exchanges/feelings assessed (e.g.,

criticism/support vs. neglect/companionship vs. resentment/love), and the timeframe within which participants are asked to reflect on those exchanges/feelings (e.g., in general vs. within the past month) may lead to differing researcher conclusions about a) how pervasive ambivalent ties are and b) how they impact health.

Conceptual definitions of ambivalent ties as relationships that elicit both positive and negative feelings and/or feelings of ambivalence (e.g., Social Ambivalence and Disease model; Holt-Lunstad & Uchino, 2019) run the risk of confounding these perspectives. Although one's feelings about a social tie are undoubtedly driven by their perception of the social tie's behavior, there lies a subtle distinction between these phenomena that would benefit from further investigation. As learned from the current dissertation (Study 3), it is possible that the health consequences of ambivalent ties are related to the negative feelings elicited by these ties, more so than ambivalent feelings per se. Study 3 did not directly assess emotions elicited by ambivalent ties, but the finding that negative affect valuation (NAV) buffered the link between daily exposure to ambivalent ties and worse health limitations suggests that ambivalent ties may be eliciting negative affect (given prior evidence that NAV operates to buffer affect-health linkages; Luong et al., 2016, 2023).

Another area of ambiguity in the emerging literature is whether ambivalent ties are assessed at the tie-level vs. domain-level. For instance, ambivalent ties (assessed at the tie-level) are related to shorter telomeres (Uchino et al. 2012), but ambivalent extended-kin ties (assessed at the domain-level) are related to longer telomeres (Lincoln et al., 2019). Future studies can decipher whether relationship domains (e.g., family network) characterized by ambivalence (high support/high strain) capture a similar construct to that of specific relationships identified as sources of both support and strain. One study found that older adults with ambivalent marital

partners were also more likely to have children and friend domains characterized by ambivalence (Wilson & Marini, 2024). Those data did not include support/strain assessments for specific children/friend ties, making it unclear whether domain-level ambivalence was indeed capturing ambivalent *ties*. Those authors' findings, nonetheless, highlight the need to consider possible connections between tie-level and domain-level ambivalence.

Finally, much of the existing evidence of links between ambivalent ties and health has been drawn from predominantly non-Hispanic White samples. Recent studies have begun to examine cultural variations in ambivalent ties, but more work is needed to understand how cultural factors might buffer, or exacerbate, the role of ambivalent ties in older adults' health and well-being. For instance, one study among U.S. Chinese older adults found that ambivalent family profiles were related to better cognitive functioning (Li et al., 2021), which contrasts with the current study findings linking ambivalent ties to worse cognitive functioning. Another study comparing older adults in the U.S. and Mexico found that ambivalent marriages were similarly predictive of biological aging in both samples (Wilson & Marini, 2024). In sum, the study of ambivalent ties and the mechanisms through which they impact health is in its infancy, with many rich possibilities for investigation. The current dissertation helps to extend current understanding of these pervasive and salient relationships in later life and the factors that may serve to buffer their effects on older adults' health and wellbeing.

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