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Social Ambivalence and Disease (SAD): A Theoretical Model Aimed at Understanding the Health Implications of Ambivalent Relationships

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Abstract

The protective influence of social relationships on health is widely documented; however, not all relationships are positive, and negative aspects of relationships may be detrimental. Much less is known about the relationships characterized by both positivity and negativity (i.e., ambivalence). This article provides a theoretical framework for considering the influence of ambivalent relationships on physical health, including reasons why ambivalence should be considered separately from relationships characterized as primarily positive (supportive) or primarily negative (aversive). We introduce the social ambivalence and disease (SAD) model as a guide to understanding the social psychological antecedents, processes, and consequences of ambivalent relationships. We conclude by highlighting gaps in the literature and features of the SAD model that may serve as a guide to future research on potential health-relevant pathways of ambivalent relationships.

Keywords

relationships; ambivalence; health; psychophysiology; social support

Epidemiological research indicates that social relationships may significantly protect individuals from all causes of mortality (Brummett et al., 2005; Holt-Lunstad, Smith, & Layton, 2010; House, Landis, & Umberson, 1988; Lett et al., 2007). In fact, the evidence linking social relationships to mortality is comparable to and, in many cases, exceeds the evidence linking standard risk factors such as obesity and physical inactivity to mortality (Holt-Lunstad et al., 2010; Holt-Lunstad, Robles, & Sbarra, 2017). The extent to which an individual is socially connected is also inversely related to some of the most pressing health issues, including cardiovascular disease (Barth, Schneider, & von Kanel, 2010; Valtorta, Kanaan, Gilbody, & Hanratty, 2018; Vigorito & Giallauria, 2018), cancer (Burish, 2000; Pinquart & Duberstein, 2010), and pain (Jensen, Moore, Bockow, Ehde, & Engel, 2011).

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Likewise, considerable evidence links social relationships to the biological and behavioral pathways by which such associations exist (Thoits, 2011; Uchino, 2006). Thus, there is good evidence that a robust association between social relationships and physical health does exist.

Epidemiological research on social relationships and physical-health outcomes has primarily focused on structural aspects (e.g., social isolation, size of network, marital status) and functional aspects (e.g., perceived availability of support, support receipt, support provision/caregiving). However, until recently, epidemiology researchers have paid little attention to both the positive and negative aspects of these relationships, which may influence the magnitude and direction of the associations between relationships and health. Thus, the main goal of this review is to propose a theoretical model on relationships that are characterized by both positive and negative aspects (i.e., ambivalent). We call this the *social ambivalence and disease* (SAD) model, which highlights the potential health consequences of these relationships. This model further elucidates the underlying biological and behavioral mechanisms that lead to such outcomes as well as the antecedent and concurrent processes that influence relationship ambivalence development and maintenance.

This conceptual framework is illustrated in Figure 1 and is briefly presented here. An important argument in our theoretical model is that positivity and negativity in relationships are separable constructs and thus can be jointly experienced in any given relationship. As a result, these constructs have a distinct influence on health-relevant pathways and disease outcomes. Thus, the SAD model proposes that ambivalence has unique consequences on disease and specifies the underlying processes by which these outcomes occur. More specifically, the model argues that societal and social psychological factors play an important role in the emergence of relationship ambivalence. Chief among these factors are conflicting societal norms and developmental transitions, the early family environment, personality/individual differences, specific interpersonal transactions, and transference. Once established, the SAD model highlights the subsequent social-cognitive and behavioral processes reinforcing and maintaining ambivalent ties, including internal barriers, coping strategies, ongoing mixed interactions, and self-related processes. More specific interpersonal mechanisms based on contact frequency, stress enhancement, and support interference in turn can lead to health-relevant behavioral and biological changes that place an individual at risk for the development of physical health problems or the exacerbation of existing chronic disease conditions.

In the remainder of this article, we present the SAD model, supporting evidence, and unique intervention implications and directions for future study. This article is not meant to be an exhaustive or systematic review of all evidence on ambivalence and health outcomes; rather, we highlight supporting evidence as well as gaps in the literature that may guide future research. However, we first start with a brief review of links between positive and negative aspects of relationships and the measurement of ambivalence that forms the basis for this analysis.

Importance of Relationship Positivity, Negativity, and Ambivalence

Although social relationships can be sources of joy, companionship, nurturance, and compassion, they can also be sources of conflict, insensitivity, jealousy, and rejection (Rook & Charles, 2017). For example, whereas network support is associated with better prognosis among breast-cancer patients, low-quality relations and burden in family relations are associated with higher risk of mortality (Kroenke et al., 2013). Research also suggests that negativity in social relationships predicts greater risk for mortality (Birditt & Antonucci, 2008; Friedman et al., 1995; Tanne, Goldbourt, & Medalie, 2004; Tucker, Friedman, Wingard, & Schwartz, 1996). Likewise, distressed marriages are associated with poorer immune outcomes (Price, Repetti, Robles, & Carroll, 2018) and greater morbidity and risk for mortality (Choi & Marks, 2011; Kimmel et al., 2000; King & Reis, 2012; Robles & Kiecolt-Glaser, 2003; Robles, Slatcher, Trombello, & McGinn, 2014). Taken together, the data suggest that having more and higher quality relationships is associated with protective health effects, whereas having fewer and poorer quality relationships is associated with deleterious effects on health (for a review, see Uchino, 2006; see also De Vogli, Chandola, & Marmot, 2007). Thus, consideration of both the negative and the positive aspects of social relationships is needed to fully understand the health-related consequences of social relationships.

It is noteworthy that positive and negative aspects of relationships are separable dimensions (Finch, Okun, Barrera, Zautra, & Reich, 1989; Fiore, Becker, & Coppel, 1983; Kiecolt-Glaser, Dyer, & Shuttleworth, 1988; Newsom, Nishishiba, Morgan, & Rook, 2003; Newsom, Rook, Nishishiba, Sorkin, & Mahan, 2005). We have thus developed a broad framework linking positive and negative relationships to health on the basis of the evaluative-space model of Cacioppo, Gardner, and Berntson (Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson, 1997), which proposes that positive and negative evaluations can have both separable and joint influences on affect and behavior (see Fig. 2). Therefore, just as we may have ambivalent attitudes toward a variety of attitudinal objects, we may have ambivalent attitudes toward specific social relationships—which has not received adequate attention in the relationship literature. When applied to social relationships, high levels of positivity and low levels of negativity characterize a primarily positive or *supportive* relationship, and high levels of negativity and low levels of positivity characterize a primarily negative or *aversive* relationship. Low levels of both positivity and negativity characterize an *indifferent* relationship. Prior research has focused primarily on protective effects of primarily positive (supportive) relationships or the risks associated with negative (aversive) relationships, largely ignoring or miscategorizing relationships that contain a mix of positivity and negativity, potentially leading to error that can influence the kinds of conclusions that are drawn.

The SAD model specifically focuses on the novel category of ambivalent relationships. We thus define ambivalent relationships as any specific relationship that contains salient levels of both positive and negative aspects. For example, consider a relationship that is characterized by love and/or companionship but in which either partner can also be frustrating, demanding, competitive, or inconsiderate at times. Whether it is a friend, family member, or colleague, many individuals have people in their social network that might fit

this description. These types of relationships are not entirely positive or entirely negative, which prompts the question, “What kind of influence do such relationships have on health?” We argue that such relationships uniquely influence health, as illustrated by the SAD model.

There are empirical and conceptual reasons to believe that ambivalent relationships may be uniquely bad for health. Initial research on the health effects of ambivalence considered two competing health predictions: (a) the possibility that individuals may still benefit from positivity that exists in ambivalent relationships and (b) the possibility that the concurrent negativity within the relationship may be more salient and hence deleterious. The current evidence appears to support the latter conclusion. For instance, multiple studies have demonstrated greater cardiovascular reactivity among participants interacting with an ambivalent relationship compared with participants interacting with a supportive relationship (Birmingham, Uchino, Smith, Light, & Sanbonmatsu, 2009; Holt-Lunstad, Uchino, Smith, & Hicks, 2007; Reblin, Uchino, & Smith, 2010). In addition, these associations hold when also controlling for positivity and negativity, making it clear that their joint influence is driving these findings (Herr et al., 2019; Uchino et al., 2012; Uchino, Bosch, et al., 2013).

Conceptually, there are also several reasons to believe that an examination of ambivalent relationships may contribute to deleterious health influences over and above the main effects of negativity in relationships. Regarding the unique contributions of ambivalence, presumably there are three possible and potentially plausible outcomes: (a) Only the level of negativity present in the relationship is important, and thus there would be no difference between ambivalent and aversive relationships; (b) because ambivalent relationships are somewhat positive, they would be less detrimental than aversive relationships; or (c) ambivalent relationships may be more detrimental than aversive relationships. Currently the data appear to support the last of these possible outcomes (for illustrative example, see Holt-Lunstad et al., 2007), and there are potentially multiple conceptual reasons for this. For instance, insensitive, negative, or frustrating behaviors may be more hurtful (and thus influential) coming from an ambivalent relationship compared with an aversive relationship because ambivalent relationships are by definition characterized by some degree of positivity, suggesting that individuals care about or value this relationship. Likewise, individuals may habituate to their aversive relationship by using specific coping strategies (e.g., discounting or avoidance); however, an individual for whom one feels ambivalence may be less predictable and thus may be associated with heightened interpersonal stress (Holt-Lunstad & Clark, 2014). Furthermore, interactions with an ambivalently perceived network member may be more ambiguous, so efforts to understand these interactions may lead to increased ruminative thinking (Glynn, Christenfeld, & Gerin, 2002). Finally, ambivalent relationships may also be maintained more closely than aversive relationships. Increased interaction and involvement within ambivalent relationships may provide greater opportunity to influence health-relevant processes than aversive relationships do. These basic principles form the basis for the SAD model, and the proposed unique associations with health and the evidence for it will be reviewed below.

Ambivalence Measurement

To address the potential unique contribution of relational ambivalence, we also need to consider how it is measured. Most prior work starts with separate ratings of positivity and negativity in relationships. We have used questions that keep the context of the positive and negative ratings constant and hence avoid confounding these assessments (e.g., measuring one dimension more broadly than the other; Rook & Pietromonaco, 1987). In our prior work, we have relied on ratings of how helpful or upsetting each of the participant's network members was (1 = *not at all*, 2 = *a little*, 3 = *sometimes*, 4 = *moderately*, 5 = *very*, 6 = *extremely*) when the participant has needed emotional, tangible, and informational support. Further work has expanded these ratings to include when the participant encounters network members in positive and neutral contexts as well as self–other perceptions (e.g., Birmingham, Uchino, Smith, Light, & Butner, 2015; Holt-Lunstad et al., 2007).

Given the separate positivity and negativity ratings, one can examine relational ambivalence at the individual and network levels (Campo et al., 2009). The individual level examines specific relationships such as a significant other or parent, whereas the network level examines the extent of network relationships that are ambivalent. When examining specific relationships, prior work has used several operationalizations, including (a) a threshold approach in which specific cutoffs are used for identifying ambivalent relationships, (b) interactions between continuous positive and negative relationships ratings, and (c) formulas that combine positivity and negativity on the basis of theory (Cacioppo & Berntson, 1994; Holt-Lunstad, Uchino, Smith, Olson-Cerny, & Nealey-Moore, 2003; Priester & Petty, 1996; Thompson, Zanna, & Griffin, 1995; Uchino, Bosch, et al., 2013).

For our program of research, we decided that a threshold model was the most conceptually appropriate because it can be used flexibly for both specific relationships and overall network ambivalence (i.e., the number of ambivalent ties; Campo et al., 2009; Uchino, Smith, Carlisle, Birmingham, & Light, 2013). We also adopted this model because most ratings of relationships' negativity in our studies are skewed at the lower end (i.e., 1 or 2 on our scale), which reduces variability on this aspect of relationship quality. This threshold model led to the following relationship classifications:

- a *supportive* network member received ratings of 2 or greater on "helpful" and only 1 on "upset";
- an *aversive* network member received ratings of only 1 on "helpful" and 2 or greater on "upset";
- an *indifferent* network member received ratings of only 1 on "helpful" and only 1 on "upset"; and
- an *ambivalent* network member (i.e., one who was perceived ambivalently) received ratings of 2 or greater on both "helpful" and "upset."

Prior research has established the temporal stability of this approach with significant 3-month test–retest reliability for the number of supportive ties ($r = .61$, $p < .001$), aversive ties ($r = .30$, $p < .001$), and ambivalent ties ($r = .68$, $p < .001$), and the approach has good

convergent (e.g., perceived support) and discriminant (e.g., personality) validity (Campo et al., 2009).

If examining specific relationships, an alternative analytic approach would be to model the Helpful × Upset interactions using continuous ratings. There are several reasons why we chose our threshold operationalization of ambivalent ties (Uchino et al., 2001; Uchino et al., 2012). First, some of the relationship types we may wish to examine (i.e., spouse, friend) are rarely rated as aversive (only negative). Thus, the testing of such an interaction would force individuals into aspects of our model that are not present in the data. Of course, with other relationships, this might be appropriate (e.g., coworkers) because one might expect the full range of relationships. Note that this procedure is based directly on our conceptual model, has been used consistently across our program of research, and can be used to guide potential clinical screening procedures given the specificity of our approach. However, this issue raises the possibility that our classification might mean in some cases that relationships (e.g., spouses) viewed as sources of ambivalence differ primarily from spouses viewed as sources of positivity in one of these ratings. We addressed these issues by contrasting ambivalent ties with other relationship types (see Fig. 1) or statistically controlling for the extent of positivity/negativity. In several cases, we also used experimental manipulations of ambivalence (Carlisle et al., 2012; Holt-Lunstad & Clark, 2014). In each case, ambivalent relationships appeared to explain variance in health-related outcomes above and beyond other relationship types (e.g., aversive relationship) or to remain significant predictors in analyses statistically controlling for ratings of relationship negativity (Birmingham et al., 2015; Carlisle et al., 2012; Uchino et al., 2012; Uchino, Bosch, et al., 2013; Uchino, Kent de Grey, & Cronan, 2016). The issue of the unique contribution of ambivalent ties will be discussed in greater detail below.

Evidence for the SAD Model

In this section, we review existing evidence on the SAD model. This model is interdisciplinary and integrates literature from social psychology, clinical psychology, developmental psychology, sociology, communication, relationship science, and medicine. For each component, we first highlight what is currently known, and then in the following section, we highlight gaps in the literature that point to important areas of future research.

Health-relevant consequences

Relationship ambivalence may have unique consequences for physical health and disease. According to the SAD model (Fig. 1), ambivalent relationships may negatively influence acute and chronic health (top right box) indirectly through their influence on health-relevant behaviors (top left box) or more directly influence health-relevant biological functions (top center box). Most of the current work has focused on the latter.

Acute and chronic disease outcomes.—Robust data have linked social relationships to acute and chronic disease outcomes, yet the majority of studies on morbidity and mortality do not assess relationship positivity and negativity— let alone their joint contribution. Although relatively limited data exist relative to other relationship conceptualizations, some of the first evidence has emerged linking ambivalence to actual

cardiovascular disease outcomes (Uchino, Smith, & Berg, 2014). In one study, the level of coronary artery calcification (CAC) was higher primarily when both individuals in the marriage viewed each other as sources of ambivalence compared with when only one member of the dyad saw his or her spouse as supportive or ambivalent or both viewed the dyad as supportive (Uchino et al., 2014). Note that CAC is a marker of an artery with atherosclerotic disease. CAC is a strong and independent predictor of coronary events in both symptomatic and asymptomatic individuals and an independent predictor of death.

Health-relevant biological processes.—According to the SAD model, ambivalent relationships can influence acute and chronic health conditions via health-relevant biological processes (i.e., central nervous system, autonomic, endocrine, immune functioning). Current evidence has primarily focused on autonomic functioning because of its relative feasibility in assessment and relevance to cardiovascular disease. Examining the effect of ambivalence on cardiovascular functioning is a compelling first step in establishing the health relevance of ambivalence given that coronary heart disease (CHD) is the number one cause of death in the United States and most industrialized countries for both men and women. One way in which relationships might influence risk for CHD is through elevation in blood pressure (BP), either during the time of the interaction or as a long-term consequence of repeated interactions. If such alterations in cardiovascular function are chronic or pervasive, this could presumably affect CHD risk. Thus, to address this hypothesis, researchers have primarily used two different methodological techniques: (a) examining interactions within a tightly controlled laboratory setting and (b) examining interactions in daily life via ambulatory and diary methods.

Ambivalent relationship and lab-based cardiovascular response.: Multiple lab studies have contrasted the effect of interacting with someone supportive or ambivalent on cardiovascular functioning. In these studies, the different categories depicted in Figure 2 were assessed using the social relationships index (SRI; for scale-validation information, see Uchino et al., 2001) to identify relationships categorized as supportive, aversive, indifferent, or ambivalent. Cardiovascular functioning has been measured at rest (or baseline) and during stress (cardiovascular reactivity) and recovery. Cardiovascular reactivity is typically measured by examining increases in systolic BP (SBP) and diastolic BP (DBP), heart rate (HR), and their underlying determinants in response to stress. This link would be important because cardiovascular reactivity to stress has been linked to the development of cardiovascular problems (Chida & Steptoe, 2010).

Several studies have examined the influence of interacting with an ambivalent friend on cardiovascular reactivity. In these studies, participants were asked to bring in a friend to the lab as part of the study or randomly assigned to bring in a specific friend. In one such study, approximately half the sample chose to bring an ambivalent friend (Uno, Uchino, & Smith, 2002). Participants were examined interacting with a female or male friend and received emotional, tangible, or no support. Results indicated it was the quality of this friendship that was most influential on cardiovascular reactivity (Uno et al., 2002). Participants who interacted with an ambivalent female friend had the greatest DBP, total peripheral resistance (TPR), and preejection period (PEP) reactivity compared with the other conditions. TPR and

PEP, the underlying determinants of BP, suggest a greater vascular response and greater sympathetic activation of the heart among that group.

In subsequent studies, individuals were randomly assigned to bring in either a supportive or an ambivalent friend to draw stronger causal inferences. Greater SBP reactivity was found among participants discussing a stressful event with an ambivalent friend (Holt-Lunstad et al., 2007). This finding was replicated in a study that also manipulated support expectations (Reblin et al., 2010) and another study that manipulated the behavior of the friend (Holt-Lunstad & Clark, 2014). In each case, participants interacting with their ambivalent friend demonstrated greater cardiovascular reactivity relative to participants interacting with a supportive friend. The links between interacting with a friend perceived as a source of ambivalence and increased cardiovascular reactivity was recently replicated by an independent laboratory (Gramer & Supp, 2014). Even when researchers examined perceptions of ambivalence toward a new relationship (i.e., the experimenter) that was created in a laboratory setting (Birmingham et al., 2009), individuals who viewed the experimenter as high in both positivity and negativity showed the highest levels of BP reactivity during laboratory stress.

Actual interaction with an ambivalent relationship partner may not be necessary to elicit a response. For instance, there is evidence of heightened baseline cardiovascular response (Holt-Lunstad & Clark, 2014; Holt-Lunstad et al., 2007) and slower posttask recovery (Gramer & Supp, 2014; Holt-Lunstad & Clark, 2014) among participants who brought in an ambivalent friend to the lab, although they did not interact with them at the time. Another study randomly assigned participants to be subliminally primed with the names of relationships rated as low or high in positivity and/or negativity (Carlisle et al., 2012). Subliminal presentations of friends rated as ambivalent were associated with higher levels of HR reactivity during subsequent stress compared with supportive and aversive ties (Carlisle et al., 2012; also see Gramer & Supp, 2014). This link appeared to be mediated by greater parasympathetic withdrawal when primed with ambivalent ties. These data suggest that merely activating the perception of an ambivalent relationship may be sufficient to elicit a cardiovascular response.

To examine broader links between ambivalent ties and biological health-related outcomes, researchers have also examined if social networks filled with ambivalent ties are related to worse cardiovascular response. One of the first studies to examine this link was related to age-related differences in cardiovascular reactivity during stress (Uchino et al., 2001). In this study, researchers assessed the total listed number of individuals in one’s network who were only sources of support, aversion, indifference, or ambivalence. The influence of these relationship categories was examined among a sample of men and women between the ages of 30 and 70 while they performed an acute stress protocol (Uchino et al., 2001). Consistent with prior research, there was cardiovascular evidence for the benefits of having socially supportive ties. Note that there was also a significant interaction between age and ambivalent ties. Individuals with high numbers of ambivalent network ties showed greater HR and PEP changes (indicating greater sympathetic activation of the heart), an association that was mostly evident for older adults. These results were independent of demographic variables, task performance, affect, health behaviors, and other categories of relationships (e.g.,

number of supportive ties). In a follow-up study, after an average of 10 months, analyses also showed that the number of ambivalent ties predicted greater increases in BP reactivity over time, primarily in older adults (Uchino et al., 2016). Thus, these data provided support for the model depicted in Figure 1 as well as a potential developmental process involving a cumulative influence of ambivalent social ties on disease.

In summary, laboratory studies examining the influence of ambivalent relationships relative to supportive relationships have demonstrated greater cardiovascular reactivity among both young adult (mostly undergraduate) and middle to older adult samples. This finding is consistent whether the target (ambivalent relationship) is physically present, whether one is interacting with an experimentally manipulated or existing relationship, whether interacting with a friend or a spouse, and whether examined at the relationship level or network level. Greater cardiovascular reactivity associated with ambivalent relationships was also seen across multiple types of laboratory tasks. Taken as a whole, the evidence suggests a generalized negative influence of ambivalent relationships on acute cardiovascular functioning in a laboratory setting.

Ambivalent ties and BP in daily life.: Daily diary methods have been extended and applied to examine social interactions and ambulatory BP. Ambulatory BP monitoring consists of a participant wearing a portable BP monitor in daily life. Instead of one or even a few readings taken in a clinic or lab, multiple readings are taken in the natural environment that the person normally experiences to better capture spontaneously occurring fluctuations in BP.

Ambulatory studies provide at least two potential advantages over laboratory studies for studying ambivalent relationships. First, one is able to examine interactions with ambivalent relationships relative to all the other relationship categories (i.e., supportive, aversive, indifferent). Given that aversive and indifferent relationships are characterized by low levels of positivity, it would be very awkward for participants to ask such an individual to come into the lab to do a study. Consequently, laboratory studies typically only contrast supportive and ambivalent relationships. Second, one is able to examine the link between the different categories of relationships (supportive, aversive, ambivalent, and indifferent) and cardiovascular functioning by assessing BP during naturally occurring social interactions. Thus, this methodology would better capture the myriad of types of interactions one might encounter in daily life, thereby enhancing the study's ecological validity. Likewise, elevated ambulatory BP may be a stronger predictor of cardiovascular outcomes, including overall morbidity and mortality, than are clinic BP readings (Dawes, Coats, & Juszczak, 2006; Dolan et al., 2005).

In one study (Holt-Lunstad et al., 2003), volunteers underwent a 3-day ambulatory BP (ABP) assessment during which a reading was taken approximately 5 min into each social interaction (event-contingent protocol; Wheeler & Reis, 1991). After each interaction, participants completed a standard diary that also included ratings of the quality of the relationship in terms of how positive and negative they normally felt toward their interaction partner. Consistent with the framework depicted in Figure 2, significant statistical interactions for relationship positivity and negativity emerged in predicting ambulatory SBP and DBP. The highest ABP was found when participants were interacting with a person for

whom they felt ambivalent. Note that not only was the effect of ambivalent relationships higher than were interactions within supportive relationships, the effect of ambivalence was also higher than interactions with aversive relationships. Furthermore, there was no significant interaction between relationship type (i.e., family, nonfamily) and ambivalence (Holt-Lunstad et al., 2003), indicating the influence of ambivalence on ABP was irrespective of different relationship sources.

Other studies have used an interval contingent sampling protocol (e.g., random reading every 20–30 min) throughout the day to determine whether ambivalent relationships influence overall BP. Studies focusing on spousal relationship quality show that ABP was elevated if a person viewed their partner as a source of both positive and negative interactions (ambivalence) as well as if they categorized their own behavior as ambivalent (Birmingham et al., 2015). Consistent with the interdependent nature of marriage, independent of a person's own ambivalent ties, one's ABP was found to be elevated if one's spouse had more ambivalent network ties (Uchino, Smith, et al., 2013). ABP was also higher if both participants and their spouses had more ambivalent ties in their social network (i.e., Actor × Partner influences; Uchino, Smith, et al., 2013). Thus, these data suggest that although perceiving one's spouse as a source of ambivalence can influence an individual's ABP, the relationships of other close ties (e.g., spouse) may also affect the individual's cardiovascular health.

Ambivalent relationships have also been connected to negative effects when ABP was studied in participants with a lower socioeconomic status. In a study examining the effects of supportive versus ambivalent marriages in low-income couples, researchers found a supportive relationship to be a buffer against negative autonomic responses (high ABP), whereas participants in ambivalent relationships experienced no buffering effects (Cundiff, Birmingham, Uchino, & Smith, 2015). This research suggests that at-risk populations may see their risk buffered in the presence of a supportive relationship; this buffer may be absent or even inverted in the presence of ambivalent relationships.

Immune functioning.: Recent research has gone beyond cardiovascular functioning and has begun to look at the influence of relationship ambivalence on inflammatory processes. Although inflammation is only one of many ways in which immune functioning can be examined, this pathway may be important because inflammation is linked not only to cardiovascular disease and mortality risk but also to increased risk of a wide range of health outcomes, including metabolic diseases, cancer, and more generally, the aging process (Dranoff, 2004; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Libby, 2002). A study of 94 married couples examined perceptions of ambivalence and its links to inflammation (Uchino et al., 2012). The primary findings indicate that spousal ambivalence in a support context was related to higher interleukin-6 and fibrinogen and marginally higher C-reactive protein (CRP). These findings were still significant when considering health behaviors, attachment style, separate spouse negativity/positivity ratings, and overall marital satisfaction.

Another study examined how ambivalence in different relationships, specifically ties between family members and friends, related to CRP levels. In a study of 300 adults, the

number of ambivalent members of an individual's family was related to marginally higher CRP levels, whereas the number of supportive members was related to lower CRP levels (Uchino et al., 2015). There was no relationship found between the levels of CRP and the number of ambivalent and supportive friends or aversive family members. Given that CRP is an inflammatory marker that has been shown to predict different health outcomes such as cardiovascular disease, metabolic disorders, cancer, and frailty, these findings suggest that different ambivalent relationships may carry different weights in the long-term health of an individual.

Cellular aging.: Research has also begun to look at the influence of relationship ambivalence on more general risk indicators of health as indexed by telomeres (Uchino et al., 2012). Telomeres are repetitive structures at the end of chromosomes that help promote the chromosomes' stability (Dahse, Fiedler, & Ernst, 1997; Saretzki & Von Zglinicki, 2002). However, with each successive replication of the cell, telomeres shorten, and when a critical threshold is met, the result is cellular senescence. This mechanism serves several critical genomic purposes, including the prevention of chromosomal fusions and unregulated cellular activity (Chan & Blackburn, 2003). Note that shorter telomeres are strong predictors of mortality across different diseases, including cardiovascular disease, cancer, and infectious diseases (Cawthon, Smith, O'Brien, Sivatchenko, & Kerber, 2003; Epel et al., 2009).

The number of ambivalent, supportive, aversive, and indifferent relationships was obtained for each member of a community sample, and participants who had a higher number of ambivalent ties in their social networks evidenced shorter telomeres (Uchino et al., 2012). These results were independent of other relationship types (e.g., supportive) as well as standard control variables (e.g., age, health behaviors, medication use). It was also found that gender moderated the links between ambivalent ties and telomere length; these associations were seen primarily in women. These data suggest that ambivalent relationships may influence aging processes at the cellular level and may be linked to more general diseases of aging.

Health behaviors and treatment adherence.—The salubrious effects of social relationships on health have been linked to their influence on health behaviors and lifestyle factors. For instance, individuals with positive social relationships engage in less risky health behaviors (Jessor, Turbin, & Costa, 1998). However, relationship factors have also been linked to poorer health behaviors, including weight gain and barriers to exercise and nutrition (Porter, Bean, Gerke, & Stern, 2010) and excessive alcohol consumption (Peirce, Frone, Russell, Cooper, & Mudar, 2000; Steptoe, Wardle, Pollard, Canaan, & Davies, 1996). Currently, very little systematic research has specifically examined the influence of ambivalent relationships on health behaviors. In one community sample, perceptions of relationship ambivalence were unrelated to sleep quality (Kent, Uchino, Cribbet, Bowen, & Smith, 2015). There is also evidence that among college students, engaging in hook-ups (engagement in sexual or physical intimacy without the expectation of a relationship) was associated not only with mental-health outcomes (psychological distress, depression, anxiety) and physical-health outcomes (sexually transmitted diseases) but also with

relationship processes (greater perceptions of ambivalence; Bachtel, 2013). There is some evidence, albeit limited, to suggest that perceptions of ambivalence may influence health-relevant behaviors, and health-relevant behaviors may influence perceptions of relational ambivalence. However, more data are needed on whether such health behaviors are important pathways linking perceptions of relationship ambivalence to subsequent health.

Treatment adherence has significant influences on health outcomes (DiMatteo, Giordani, Lepper, & Croghan, 2002). Aid or support from others influences adherence and may help explain the associations between social relationships and health outcomes. Currently, little research has specifically examined the effect of relational ambivalence on medical adherence. However, in a meta-analysis of 122 studies, adherence was found to be 1.53 times lower in patients from families in conflict and 1.74 times higher in patients from cohesive families, and family conflict has a more detrimental effect on adherence in studies using more than one method to measure adherence than in studies using only one method of measuring adherence (DiMatteo, 2004). These data suggest the potential importance of considering the influence of concurrent negativity (ambivalence) within relationships for treatment adherence.

The unique contribution of ambivalence in relationships and its links to health

An important assumption when we started this program of research almost 20 years ago was that ambivalence was qualitatively different from other relationship categories and hence a unique predictor of health-relevant biological responses. Consistent with our assumption, current evidence supports this possibility. In several studies, we examined whether the interaction between positivity and negativity during specific relationship interactions was associated with worse physiological profiles (Birmingham et al., 2009; Holt-Lunstad et al., 2003). One study showed that high positivity and high negativity were associated with higher ABP during daily life interactions compared with relatively positive and relatively negative ties (Holt-Lunstad et al., 2003). A separate, lab-based study found a statistical interaction between positivity and negativity ratings such that participants who felt high levels of both toward an evaluative experimenter showed the greatest BP reactions to a stressful task (Birmingham et al., 2009).

Perhaps more convincing was that several laboratory studies using random assignment have revealed evidence for the unique variance in health explained by ambivalent ties. One study randomly assigned individuals to subliminal activation of ambivalent, aversive, supportive, or indifferent ties (Carlisle et al., 2012). These network ties were identified in a pretesting session using the SRI. Results showed that individuals primed with ambivalent ties showed the greatest HR reactivity and parasympathetic withdrawal during stress, as indexed by respiratory sinus arrhythmia (RSA; Carlisle et al., 2012). A second study experimentally manipulated positive, negative, ambivalent, or ambiguous interactions with friends via prescripted “support” messages provided by their friends in response to the participants’ performance on a speech stressor (Holt-Lunstad & Clark, 2014). Results revealed that receiving ambivalent feedback from a friend was related to the highest level of SBP reactivity (Holt-Lunstad & Clark, 2014).

Most of the studies examining both specific ambivalent relationships (e.g., spouse) and the overall number of ambivalent network ties have statistically controlled for either underlying negativity or other relationships categories (e.g., Holt-Lunstad et al., 2007; Uchino et al., 2001, 2012, 2014, 2016; Uchino, Bosch, et al., 2013; Uchino, Smith, et al., 2013). One study examining specific relationships took a dyadic approach and found that when both actors and partners perceived ambivalence toward their spouse, this predicted higher levels of CAC (Uchino et al., 2014). Note that these results held while statistically controlling for both underlying negativity ratings as well as traditional marital satisfaction scores that are based on unipolar conceptualizations of relationships (for similar findings examining inflammatory markers as outcomes, see Uchino, Bosch, et al., 2013).

Several studies also examining ambivalence at the network level are consistent with its unique prediction of health. In a longitudinal study of young to older adults, the number of ambivalent ties predicted greater increases in BP reactivity over time, especially in older adults (Uchino et al., 2016). These results were unchanged when statistically controlling for the number of supportive or aversive network ties (also see Uchino, Smith, et al., 2013). In only two studies have our findings been partially altered by controlling for negativity (either specific network member or network level). However, even in these two studies, most links between ambivalent ties and worse physiological profiles were upheld (Birmingham et al., 2015; Uchino, Smith, et al., 2013). In conclusion, across a number of different designs, protocols, and relationships, ambivalence in social ties appears to be a unique predictor of health-relevant assessments.

Interpersonal mechanisms linking ambivalent ties to health

The SAD model also argues that there are more specific interpersonal mechanisms that might eventually lead to health outcomes (see Fig. 1). Social interaction, or extent to which one has contact with ambivalent relationships, directly influences exposure to other interpersonal processes and their health-relevant consequences. We proposed two early hypotheses. First, a network filled with ambivalent ties may entail significant interpersonal stress (i.e., stress-enhancing hypothesis). Second, individuals may be less likely to seek support from ambivalent relationships or may not benefit from support received (i.e., support-interference hypothesis).

Contact frequency.—How pervasive is the potential influence of ambivalent relationships? Given the potential detrimental influence of ambivalent relationships, it may be important to understand the potential extent of their influence. Presumably, if we have few ambivalent relationships and/or rarely interact with these individuals, their influence would be quite minimal. Perhaps the social psychological and health influence would be mitigated if such relationships were avoided. However, there is growing evidence that ambivalent relationships are pervasive. Ambivalent relationships appear to be so common that the vernacular term *frenemy* has become commonplace. A systematic examination of social networks in both undergraduate and community samples reveals that ambivalent relationships are found among all relationship types (e.g., spouse, family members, friends, coworkers, and social acquaintances), and individuals report roughly equivalent proportions of supportive and ambivalent relationships (Campo et al., 2009; Uchino et al., 2001). Prior

research has also demonstrated that supportive and ambivalent ties occur much more frequently in individuals' networks than do aversive ties (Fingerman, Hay, & Birditt, 2004; Newsom et al., 2005; Uchino, Holt-Lunstad, Smith, & Bloor, 2004; see also Rook, 2001). Likewise, the length of the relationship and frequency of weekly contact was similar among ambivalent relationships and supportive relationships (Gramer & Supp, 2014; Holt-Lunstad & Clark, 2014; Holt-Lunstad et al., 2007; Reblin et al., 2010).

Likewise, data suggest that individuals do not outright avoid ambivalent ties (Campo et al., 2009). Ambivalent ties were found in young, middle-aged, and older adult populations, and it was consistently found that close to half of important network members are viewed as ambivalent (Campo et al., 2009; Uchino et al., 2004, 2012). Note that ancillary analyses of these existing data sets have not shown age-related differences in ambivalent ties, suggesting that people toward whom one will feel ambivalent appear to be present throughout the life span.

Perceptions of ambivalence toward a spouse may be particularly relevant to examine given the importance of such relationships for the aging adult. In three separate studies, between 47% and 86% of individuals report feeling ambivalent toward their spouse (Birmingham et al., 2015; Uchino, Bosch, et al., 2013; Uchino et al., 2014). Given that contact between spouses is typically very frequent (i.e., daily), these findings further reject the notion that ambivalence is associated with low contact frequency. Taken together, it appears that contact with ambivalent ties is voluntary and frequent. Thus, exposure to and potential influence of relational ambivalence may be high.

Stress enhancement.—Are ambivalent relationships a significant source of stress? The answer to this question appears to be affirmative. For instance, the number of ambivalent ties is typically correlated with greater interpersonal conflict from social networks (Campo et al., 2009; Uchino et al., 2001). In addition, other results suggested more subtle ways in which ambivalent friends may be stressful. State anxiety was elevated for individuals who were with an ambivalent friend throughout the entire study, including during relaxation/baseline periods (Holt-Lunstad & Clark, 2014; Holt-Lunstad et al., 2007). In addition, analyses of baseline levels of cardiovascular activity showed that participants anticipating interacting with ambivalent friends had significantly higher HR, an effect driven by lower parasympathetic control of the heart as indexed by RSA. Such reductions in RSA may signify decreases in self-regulatory ability (Thayer, Hansen, Saus-Rose, & Helge Johnsen, 2009). In another study, participants randomly assigned to bring in an ambivalent friend had higher BP before, during, and after a stressor task relative to participants who brought in a supportive friend—although the friend was in a separate room and they were not actually interacting with the friend (Holt-Lunstad & Clark, 2014). Thus, these data may indicate a reduced ability to regulate aspects of the cardiovascular system in the mere presence and anticipation of interacting with such ambivalent ties. This finding appears evident even at a less conscious level given that subliminal activation of ambivalent relationships was related to greater HR reactivity and parasympathetic withdrawal (RSA) during a subsequent self-relevant stressor (Carlisle et al., 2012).

Support interference.—Are we less likely to benefit from social support from an ambivalent relationship? The stress-buffering hypothesis suggests that relationships may be beneficial in the context of stress by altering perceptions of stress or helping one cope with stress and thereby damping one's stress response; however, some evidence suggests that social support from an ambivalent relationship may not have a buffering effect. To examine the support-interference hypothesis, studies have examined support during stress (a) contrasting support from ambivalent and supportive relationships and (b) contrasting interactions with ambivalent relationships during stress and non-stressful contexts. Finally, studies have examined whether individuals are less likely to seek support from their ambivalent friends.

Multiple studies have found evidence of a stress-buffering effect of supportive relationships that is not evident for ambivalent relationships when participants are engaging in a laboratory stressor (e.g., Carlisle et al., 2012; Holt-Lunstad & Clark, 2014; Uchino et al., 2001). Likewise, studies that mimic support exchanges (discussing a stressful event) find greater cardiovascular reactions among discussions with an ambivalent friend relative to a supportive friend (Holt-Lunstad et al., 2007). Individuals also reported that ambivalent friends were more distressing in the past when they needed support from them (Holt-Lunstad et al., 2007). Moreover, independent judges rated ambivalent friends as providing less emotional support and engaging in more negative behaviors (Reblin et al., 2010). Among a sample collected in Austria by an independent lab (Gramer & Supp, 2014), it was found that participants who brought in an ambivalent friend had heightened cardiovascular responses (SBP reactivity) during anticipation of the interaction and while receiving active support during a stressor, but slower recovery compared with participants who brought in a supportive friend; the active-support condition was associated with the greatest response. Moreover, participants who received active support from an ambivalent friend did not perceive it as supportive. Note that recovery from the stressor was equivalent among participants who brought in an ambivalent friend and those in a no-support condition. These findings suggest that active support from an ambivalent friend was not only less effective relative to a supportive friend but had no stress-buffering effect.

Given that we turn to our relationships in a variety of contexts, not just in times of stress, comparing these contexts may help elucidate any effects specific to stress interference. When examining responses to supportive and ambivalent relationships beyond the support contexts (nonstressful; i.e., positive, neutral), the data are strongest in terms of interactions in a stressful (social support) context. For instance, cardiovascular reactivity was highest when discussing a stressful event with an ambivalent friend even compared with discussing a positive (social capitalization; see Gable & Reis, 2010) or neutral event (daily life; Holt-Lunstad et al., 2007; Reblin et al., 2010).[1] However, ambivalence in other contexts was less consistently related to physiological responses (inflammation), although ambivalence in a capitalization context was related to one of several inflammatory markers (Uchino et al., 2012). Thus, these data start to delineate the crucial contexts (e.g., stress/support) in which ambivalent ties may be most consequential (Uchino, Bosch, et al., 2013). In general, these

[1]·Sharing positive events (i.e., social capitalization) is linked to greater personal and interpersonal benefits.

associations may be evident in a support context because it is a context with high resource value (e.g., advice) and is linked to intimacy and self-worth (e.g., putting your problems and trust on the line; Gable & Reis, 2010; Reis & Shaver, 1988; Uchino, 2004).

Evidence suggests that individuals also may be somewhat less likely to turn to their ambivalent relationships in times of stress for support. For instance, when individuals are asked to rate how likely they are to turn to their ambivalent and supportive friends for support during stressful, positive, and neutral contexts, ratings were relatively higher for supportive friends. Note that despite relative differences, subjects were highly likely to seek support from both supportive and ambivalent friends (Holt-Lunstad et al., 2007). However, in a study using experience sampling, ambivalence toward a spouse was related to lower ratings of self-disclosure (Birmingham et al., 2015). Likewise, another study found that participants reported using more emotional distancing among ambivalent compared with supportive friendships (Bushman & Holt-Lunstad, 2009). Taken together, these data suggest that although individuals may be likely to seek support from ambivalent relationships, albeit less so than from supportive relationships, they may be less open and more guarded during support seeking.

Stress enhancement and support interference.—Note that the stress-enhancement and support-interference hypotheses may not be independent and may be interrelated as a result of reciprocal interpersonal relationship processes (as reflected in the bidirectional arrow in the SAD model). To examine this potential bidirectionality further, studies have attempted to tease apart the actual behaviors (supportive/positive; negative/upsetting) of the ambivalent relationship partner and the perceptions (supportive/positive; negative/upsetting) of the individual toward the ambivalent partner. In one study, friends were preselected on the basis of ratings of ambivalence or supportiveness, and researchers had them interact with participants in a neutral or negative context (Reblin et al., 2010). Interactions were behaviorally coded using the social support interactional coding system (Pasch & Bradbury, 1998). As noted earlier, friends viewed as sources of ambivalence were rated as providing less emotional support and more negative behaviors such as criticizing and blaming. Of course, these latter behaviors are likely to be associated with stress enhancement in its own right.

In another study (Holt-Lunstad & Clark, 2014), these questions were examined by manipulating the behavior of the friend. As in previously described protocols, participants were randomly assigned to bring in either a supportive or ambivalent friend (i.e., support or ambivalence was based on prior ratings). Friends provided the participant with positive, negative, ambivalent, or ambiguous feedback following a speech task. Unbeknownst to the participant, the feedback was randomly assigned and standardized. Blood pressure reactivity was higher among participants who brought in an ambivalent friend compared with participants who brought in a supportive friend. Higher BP reactivity was also found among participants who received ambivalent feedback compared with participants who received positive or ambiguous feedback. However, there was no significant interaction between the friend's feedback and the relationship quality. Thus, both broad relationship perceptions and their objective behavior appear to independently contribute to enhance stress. Taken

together, these studies suggest that interpersonal processes associated with both partners may contribute to support interference and stress enhancement.

Predisposing antecedent ambivalence processes

According to the SAD model, several factors set up conditions that can lead to the development of relationship ambivalence, including conflicting societal norms/ developmental transitions, the early family environment, personality/individual differences, specific interpersonal transactions, and transference.

Conflicting societal norms.—At a broad level, it has been argued that conflicting societal norms may be at the heart of the development of relationship ambivalence, especially to the degree that these norms relate to developmental transitions (Hillcoat-Nalletamby & Phillips, 2011; Luscher, 2011; Luescher & Pillemer, 1998). These conditions are most evident when examining intergenerational relationships such as older parents and their adult children. Although most of this prior research on intergenerational relationships has focused on the emergence and importance of solidarity (e.g., affection, cohesion; Bengtson & Harootyan, 1994), this approach has been criticized as not acknowledging the significant levels of conflict that can coexist with solidarity in intergenerational relationships (i.e., ambivalence; Luescher & Pillemer, 1998).

There are at least two well-documented examples of how societal norms in the context of developmental transitions may contribute to the formation of relationship ambivalence. First, parents have expectations for their children that stem from societal norms regarding successful development. That is, parents expect that their children will generally transition from a state of dependence to both financial and familial independence (Luescher & Pillemer, 1998). When adult children fail to meet these expectations, perceptions of relationship ambivalence are heightened (Birditt, Fingerman, & Zarit, 2010; Kiecolt, Blieszner, & Savla, 2011; Pillemer et al., 2007; Pillemer, Munsch, Fuller-Rowell, Riffin, & Suitor, 2012; Pillemer & Suitor, 2002; Wethington & Kamp Dush, 2007). For instance, one longitudinal study over a 14-year period found that as children moved from adolescence to early adulthood, marriage was related to decreases in parents' perception of ambivalence toward an adult child (Kiecolt et al., 2011). In general, when adult children are able to meet societal expectations for normative development, relationship ambivalence tends to decrease (Luescher & Pillemer, 1998).

A second example of how societal norms can set up conditions that facilitate relationship ambivalence can be found when adult children become caregivers for an older parent with health problems (Luescher & Pillemer, 1998). There are strong societal norms that family members should take care of their aging parents (Willson, Shuey, & Elder, 2003). This norm can lead to perceptions of relational ambivalence for both caregivers and care recipients (Spitze & Gallant, 2004; Van Gaalen, Dykstra, & Komter, 2010; Willson, Shuey, Elder, & Wickrama, 2006). Older parents may feel ambivalence toward their adult children because of their need for independence apart from the child (Spitze & Gallant, 2004), whereas adult children may feel ambivalence toward the parent because of conflicting norms regarding

caring for a parent in contrast to caring for one's own "new" family (their own children; Van Gaalen et al., 2010; Willson et al., 2006).

Early family environment.—A second important factor contributing to the development of ambivalence is the early family environment. More specifically, harsh and inconsistent family environments (e.g., rejection, hostility, punishment) are related to greater perceptions of ambivalence toward the parent (Surjadi, Lorenz, Conger, & Wickrama, 2013; Willson et al., 2003). One study used data from the Family Transitions Project, which is an ongoing study of 550 individuals followed from early adolescence to young adulthood (Surjadi et al., 2013). This study found that early reports of harsh family environments were related to adult children's later reports of ambivalence toward parents as well as increased externalizing behavior. Note that these factors in turn were related to perceiving a subsequent spouse ambivalently (Surjadi et al., 2013). Of course, the early family environment is also shaped by child-related factors (e.g., disposition, mental-health status). One study reported that child behavioral problems (e.g., expulsion from school, troubles with law) were related to greater parental perceptions of ambivalence toward the child (Kiecolt et al., 2011). Overall, these data are consistent with models highlighting the critical importance of the early family environment in shaping social and behavioral processes that can facilitate or impede relationship functioning (Bryant & Conger, 2002; Repetti, Taylor, & Seeman, 2002; Uchino, 2009a, 2009b).

Personality and individual differences.—Personality and individual differences that arise from this early family environment may also be important as antecedent processes to the development of relationship ambivalence. Although there is less evidence to this point, several studies suggest that general attachment style may be related to ambivalence in specific relationships. Individual differences in attachment style are thought to arise from early infant–caretaker interactions and set the basis for working models of the self and others as reliable or secure (Bowlby, 1982). However, if these interactions are inconsistent or negative, infants may develop more ambivalent or avoidant attachment systems (Ainsworth, Blehar, Waters, & Wall, 1978). Several studies have found that more secure attachment styles were related to lower perceptions of ambivalence toward parents and spouses (Levy, Blatt, & Shaver, 1998; Maio, Fincham, & Lycett, 2000; Uchino, Bosch, et al., 2013). Other preliminary studies focusing on trait negative affect/neuroticism and hostility have not found links to ambivalence across a broad range of network members (Uchino et al., 2001). Individual differences in emotional intelligence or wisdom may also influence the capacity to experience ambivalence. For instance, given that in reality each person has varying degrees of positive and negative qualities, the ability to see other's variegated qualities and be able to handle this judiciously and empathetically may be related to less ambivalence. Indeed, higher trait emotional intelligence and social skills have been associated with less emotional and behavioral difficulties (Poulou, 2014). Another possibility is that individuals who do not regulate their emotions well in social interactions are more likely to report ambivalent feelings for their relationship partners because of a history of mixed experiences with these individuals. Researchers have not directly examined this idea, but it may be a fruitful line of inquiry that should be considered in future research.

Interpersonal transactions.—A pattern of mixed interpersonal transactions or interpersonal tensions in the context of a previously positive relationship can also lead to relationship ambivalence in both familial and nonfamilial relationships. In fact, simply knowing that another liked individual has discrepant attitudes or conflicting traits is related to greater feeling of ambivalence toward that person (Gebauer, Maio, & Pakizeh, 2013; Priester & Petty, 2001). Duffy, Ganster, and Pagon (2002) also found that coworkers are often a source of both supportive behaviors (e.g., emotional support, advice) and undermining behaviors (e.g., talked behind your back, belittled you). Moreover, relatively high levels of both support and undermining (ambivalence) from a supervisor were related to participants being more counterproductive at work and experiencing lower levels of work self-efficacy, commitment, and well-being (Duffy et al., 2002).

Consistent with the importance of interpersonal transactions in the development of ambivalence, research focused on the family environment also suggests that adult children's current emotional and behavioral problems were related to greater parental perceptions of ambivalence toward the adult child (Birditt et al., 2010; Ingersoll-Dayton et al., 2011). Individuals coping with stressful situations also report problematic interactions, including poor or misguided support attempts that can lead to perceptions of ambivalence toward friends and family (Lehman, Ellard, & Wortman, 1986). For instance, individuals with chronic diseases (e.g., cardiovascular, cancer, diabetes) may experience problematic social interactions related to social control or poor quality/quantity of support (Dakof & Taylor, 1990; Franks et al., 2006; Helgeson, Novak, Lepore, & Eton, 2004; Martire, Schulz, Helgeson, Small, & Saghafi, 2010). More generally, acts of betrayal in a previously positive relationship may be important contributors to perceptions of relationship ambivalence. Hansson, Jones, and Fletcher (1990) found that about 50% of older adults were able to recount significant acts of betrayal by members of their immediate family or support network. As noted by Hansson and colleagues, many of these incidents occurred more than 20 to 30 years earlier but still maintained their significance in later life.

Transference.—Finally, transference can also contribute to the development of ambivalence in new relationships (Andersen & Przybylinski, 2012). The conceptualization of transference comes for early models that recognized the importance of relationships for the development of the self (e.g., Sullivan, 1953). Basically, transference occurs when another person resembles a close, important other (e.g., appearance, mannerisms, traits; Andersen & Chen, 2002). This resemblance leads to automatic activation of the important-other representation that then influences one's sense of self, emotions, and behavior toward that person. In a seminal program of research, Andersen and Chen (2002) and Andersen and Przybylinski (2012) showed that transference is quite common and has important downstream consequences on interpersonal perception and interactions, in some cases leading to a self-fulfilling prophecy in which individuals elicit responses consistent with the important-other representation (e.g., Berk & Andersen, 2000). Of particular relevance for this review, it has also been shown that transference can occur for more mixed or ambivalent relationships (Berenson & Andersen, 2006; Berk & Andersen, 2008). In these studies, individuals who experienced transference stemming from an ambivalent relationship (e.g., loved parent but a history of abuse) showed signs of positivity (e.g., implicit affect, affection

seeking) toward the relevant new relationship but also viewed that person more negatively (rejecting, less trust; Berenson & Andersen, 2006; Berk & Andersen, 2008).

Processes that maintain relationship ambivalence

According to the SAD model, several factors set up conditions that may lead individuals to maintain ambivalent relationships, including why and how the relationship is maintained as well as processes that maintain perceptions of ambivalence. These factors include internal barriers, coping strategies, ongoing interpersonal transactions, and self-related processes.

Internal barriers.—If ambivalent relationships are characterized by interpersonal conflict, why do people not end these relationships? Clearly some relationships (e.g., family, work) are not easy to exit because of strong external or social pressures; however, similar frequency distributions of supportive and ambivalent classifications have been found among friendships (Holt-Lunstad et al., 2007), which are presumably voluntary relationships, suggesting internal factors may be relevant. The role of internal and external relationship factors that might maintain ambivalent relationships was examined in a study by Bushman and Holt-Lunstad (2009). External factors included variables outside the individual such as physical proximity, financial dependency, and involvement in social groups, whereas internal factors originated from the individual, such as their beliefs and sense of commitment (Hess, 2000). Participants were randomly assigned to rate either a supportive or ambivalent friend on these measures of relationship maintenance. The main results suggest that ambivalent relationships are not maintained primarily because of obligation or external barriers but rather are viewed as voluntary associations maintained primarily because of internal factors (Bushman & Holt-Lunstad, 2009). The two most important internal factors included a personal commitment to the relationship and the positive aspects of ambivalent friendships that were viewed as either redeeming or impeding termination. Although internal barriers far outweighed external barriers in maintaining friendships among younger adults, additional research is needed to determine whether external barriers may be more influential among other types of relationships (e.g., family, coworkers) and among older adults.

Coping strategies.—Although ambivalent relationships appear to be voluntarily maintained, how they maintain these relationships may differ. Of course, individuals often attempt to cope with ambivalent relationships to reduce the uncomfortable nature of such perceptions (Sawicki et al., 2013). This finding presents challenges given the mixed nature of such relationships. In one study, it was found that relational distancing—both physical (not spending time with the individual) and emotional (not self-disclosing)—was used significantly more frequently as a coping technique with ambivalent friendships than with supportive friendships (Bushman & Holt-Lunstad, 2009). More generally, individuals report a range of coping strategies to handle ambivalent ties, including lying, withholding information, excusing their behavior, reducing expectations, adjusting help giving, and confronting (Ingersoll-Dayton et al., 2011; Nordgren, van Harreveld, & van der Pligt, 2006; Spitze & Gallant, 2004). Note that most of these coping strategies decrease the transformative potential within ambivalent relationships (Hillcoat-Nalletamby & Phillips, 2011). That is, these coping strategies are such that the person viewed as a source of ambivalence is not aware of his or her behavior, which may inadvertently maintain such

ambivalent relationship perceptions over time. Although confronting can potentially be beneficial, even it does not guarantee positive changes because in some cases it can lead to increased interpersonal tension within the relationship (e.g., feelings of not being appreciated; Duck & Wood, 1995; Spitze & Gallant, 2004). In addition, motivation to cope and resolve ambivalence may depend on one's level of commitment and knowledge about the person (Sawicki et al., 2013; van Harreveld, Rutjens, Rotteveel, Nordgren, & van der Pligt, 2009). When a person is knowledgeable about a relationship (as is likely with our close ties), ambivalence may be maintained because individuals are less likely to seek information that might reduce that ambivalence (Sawicki et al., 2013).

Ongoing interpersonal transactions.—Given the coping strategies reportedly used with ambivalent ties, it is perhaps not surprising that the behavior of the person continues to maintain such perceptions over time. In one study, individuals were asked to bring in a randomly selected ambivalent or supportive friend (as rated on the SRI) and interact with them in a support context (i.e., discussing problems; Reblin et al., 2010). The behavior of the friend viewed as a source of ambivalence was then coded by independent judges (blind to relationship condition) using the social support interactional coding system (Bradbury & Pasch, 1997). Note that friends viewed as a source of ambivalence were rated as providing less emotional support and engaging in more negative behaviors (Reblin et al., 2010). These results suggest that friends viewed as ambivalent continue to act in ways that reinforce that perception, perhaps because of a lack of feedback about their behavior.

More generally, in the context of familial and romantic relationships, some interpersonal transactions may reinforce perceptions of relationship ambivalence (Braiker & Kelley, 1979). For instance, from a parent's perspective, tensions related to past and current emotional problems of a child are related to increased perceptions of ambivalence (Birditt et al., 2010; Kiecolt et al., 2011), as are tensions regarding the adult child's continuing decisions about romantic relationships and child rearing (Peters, Hooker, & Zvonkovic, 2006). Birditt, Miller, Fingerman, and Lefkowitz (2009) also examined the link between relationship ambivalence and tensions at the relationship level (e.g., personality differences, unsolicited advice) and at the individual level (e.g., lifestyle, finances). Results showed that relationship tensions were more strongly linked to ambivalence compared with individual tensions. These data suggest that interpersonal tensions directly tied to the relationship are strong factors that maintain relationship ambivalence. These ongoing interactions with ambivalent ties also prime underlying positivity and negativity and thus sustain ambivalence toward social network ties (Bell & Esses, 2002; de Liver, van der Pligt, & Wigboldus, 2007).

Self-related processes.—Finally, self-related processes can maintain perceptions of ambivalence. This idea is consistent with the importance of relationship representations in activating and reinforcing self-relevant processes as a result of reciprocal cognitive links between self and other (relationship) representations (Aron, Aron, Tudor, & Nelson, 1991; Baldwin, 1992; Holmes, 2000; Leary, 1999; Ogilvie & Ashmore, 1991). When activated, such relationship representations can influence self-relevant processes (e.g., self-esteem) via spreading activation to aspects of the self that are most closely linked to such social ties and thus influence what aspects of the self-concept are accessible in working memory (Baldwin,

1997; Ogilvie & Ashmore, 1991). In one study, ambivalent friends were more closely linked to one's feared and disliked selves compared with more positive friends (Gabriel, Carvallo, Jaremka, & Tippin, 2008). Moreover, priming ambivalent friendships was related to greater self-liking for individuals with an avoidant attachment style (Gabriel et al., 2008).

The links between ambivalent ties and the self may help maintain ambivalent ties because individuals are motivated to verify aspects of the self (Kwang & Swann, 2010; Swann, 2012). Thus, spouses report greater commitment and are more likely to remain in a relationship when their partners see them as they see themselves, even for negative aspects of the self (Swann, De La Ronde, & Hixon, 1994; Swann, Hixon, & De La Ronde, 1992). In addition, ambivalent ties may be reinforced over time via social synchronization. Negative social synchronization occurs when individuals change the self to match negative attributes of a partner in an attempt to increase the probability of a positive social connection (Gabriel, Kawakami, Bartak, Kang, & Mann, 2010). In a series of studies, it was found that negative social synchronization was especially likely to occur for individuals high in attachment security (Gabriel et al., 2010).

Important Areas of Further Research

Despite promising results thus far, after further inspection of the SAD model, we see that the data presented here have only begun to scratch the surface in understanding the full model. Existing research has primarily focused on the interpersonal and biological mechanisms, and less is known about antecedent processes, health behaviors and treatment adherence, and development/progression of disease.

Relationship-specific antecedent processes

What factors influence the development of ambivalence in relationships? These links were most formally developed in the sociological literature on intergenerational ambivalence among parents and their adult children (Fingerman et al., 2004; Fingerman, Pitzer, Lefkowitz, Birditt, & Mroczek, 2008); however, evidence suggests that relational ambivalence is prevalent in both familial and nonfamilial relationships. Although a number of factors have been identified (i.e., societal norms, early family environment, individual differences, interpersonal transactions, transference), additional research is needed to determine whether these factors equivalently apply to and adequately capture the sources of nonfamilial ambivalence. Likewise, although there has been some investigation of couples, this work has almost exclusively focused on married couples. Yet dating couples and the myriad array of labels and behavior patterns (e.g., casual hook-up, exclusively dating, cohabitating) may be a rich source of ambivalence. Because dating is in essence a trial period before the commitment of a longer term relationship, it is likely to be rife with mixed feelings.

We must also acknowledge that the classification of relationship ambivalence is very broad. Given the broad conceptualization, the source of the ambivalence may have implications for potential coping or intervention strategies. In particular, if more specific antecedent processes in the relationship can be clearly identified (see processes that maintain relationship ambivalence in Fig. 1), it may be possible to identify particularly harmful types

of relationship ambivalence and/or develop coping mechanisms to mitigate concurrent negativity and any potential adverse influences. Data on relationship maintenance assist in outlining some of the techniques currently used in coping with these relationships, and the above findings create a starting point for examining the most adaptive and effective relationship maintenance strategies.

Interpersonal mechanisms

To achieve a complete understanding of the pathways between ambivalent relationships and health, we will need to consider the bidirectional, interactive, cumulative effects emerging over time for both partners. The standard research approach of specifying one person as the target and the other as the partner is common in health psychology work examining relationship processes but may not adequately uncover these systemic processes (Pietromonaco, Uchino, & Dunkel Schetter, 2013). For instance, across three independent samples, there is a relatively high degree of correspondence between husbands and wives' views of ambivalence toward each other (i.e., 46%, $n = 97$ couples, Birmingham, Uchino et al., 2015; 47%, $n = 95$ couples, Uchino, Bosch, et al., 2013; and 47%, $n = 154$ couples, Uchino et al., 2014). Likewise, a high degree of correspondence was found in parent–child relationships (Fingerman et al., 2008) and nonfamilial relationships (Humphries & Korfmacher, 2012). These data suggest a pattern of ambivalent exchanges within this relationship context, but it is unclear what specific behaviors and attributions are responsible for such consistency and to what extent perceptions of ambivalence are mutual across other relationships.

Support interference.—Although the majority of the existing data tends to support the support interference hypothesis in the context of stress—finding that individuals display greater cardiovascular reactivity when receiving support from an ambivalent friend and that ambivalent friends exhibit more negative behaviors—less is known about how relationships may interfere with support during positive events (social capitalization). A growing body of literature suggests that social relationships are important in both good times and bad and that perceptions of relationship responsiveness (e.g., enthusiasm and supportiveness) to positive disclosures is associated with both personal and relationship growth and well-being (Gable, Gonzaga, & Strachman, 2006). Gable and Reis's (2010) recent review of the evidence in support of social capitalization suggests responsive capitalization was associated with increased positive emotions, subjective well-being, and self-esteem and decreased loneliness for the recipient. Relationship benefits were also demonstrated, including satisfaction, intimacy, commitment, trust, liking, closeness, and stability (Gable & Reis, 2010). However, perceived responsiveness to a positive event (social capitalization) may be influenced by relationship quality or the security of the relationship (Gosnell & Gable, 2013). Because little is known about how social capitalization is linked to long-term health or health-relevant outcomes, this will be another important avenue of future research.

Stress enhancement and coping options.—The current data suggest that despite similar levels of positivity among supportive and ambivalent relationships, ambivalent relationships not only are less effective at helping individuals cope with stress but also may be sources of stress themselves. An important next step will be to determine effective coping

strategies. The identification of effective coping strategies may be particularly important given that there is reason to believe that people do not exit these relationships. Although emotional distancing was used more often in ambivalent relationships than it was in supportive relationships, it is possible that this strategy may not be effective in reducing negative health effects. For example, multiple studies have shown that individuals were more anxious and less able to relax in the mere presence of their ambivalent friends (Holt-Lunstad & Clark, 2014; Holt-Lunstad et al., 2007). Therefore, if individuals are not limiting contact with ambivalent relationships, it is possible that despite such strategies, relationships still have an effect through cognitive processes (e.g., rumination and emotional suppression). Future studies that directly test these issues may be able to identify and elucidate the most effective coping methods.

Health behaviors and treatment adherence

The influence of social relationships on health behaviors and lifestyle factors as well as adherence to medical regimens is well documented. However, almost no systematic research has specifically examined this association in the context of ambivalent relationships. Given that ambivalent relationships may be sources of stress and when individuals are under stress they are more likely to engage in unhealthy behaviors (e.g., sleep less, eat poorly, increase alcohol or other substance consumption) and have poorer adherence rates, this may be an important pathway by which ambivalence may influence health outcomes. Social conflict, including excessive controlling or nagging behaviors, even when well intended, has been shown to reduce (rather than increase) medical adherence (Warner et al., 2013). However, data from the Americans' Changing Lives study indicate that among people with a chronic illness, negative social relations at baseline was actually associated with decreased risk for mortality (Birditt & Antonucci, 2008), and the authors suggest that perhaps this is due to the buffering effect of social control. Concurrent negativity in social relationships in the context of health behaviors and medical adherence may be complex, and specifically modeling the level of both positivity and negativity (including ambivalence) may prove useful.

We must also acknowledge the possibility that because a social relationship may negatively influence health behaviors (e.g., sabotage efforts to make positive changes) or be overly controlling (e.g., overbearing), such behaviors may lead to perceptions of ambivalence in the relationship. Therefore, bidirectional associations may be of further interest.

Biological mechanisms

Another important point to specify is the biological pathways. Although finding a significant relationship between the quality of one's relationships and BP was an important first step in understanding the pathways by which social relationships may influence health, BP is only one of many risk factors for CHD. Likewise, researchers have only recently begun to look beyond cardiovascular functioning (e.g., telomere length, inflammation). There are many biological pathways by which social relationships may influence health outcomes. Although we have focused on the cardiovascular pathway, the immune, neuroendocrine, neural-functioning, and genetic pathways are also important, as are the interactions among these systems. Given that the immune system is our first line of defense in fighting off disease, demonstrating a link between ambivalent relationships and immune functioning will provide

strong evidence to support the hypothesis that social ambivalence may influence our health. Further data on immune-related inflammatory processes provide a promising avenue for greater integration among these diverse physiological systems and disease states. Most research linking social support to immune processes has emphasized its potential role in cancer, HIV, and infectious diseases more generally (Uchino, Cacioppo, & Kiecolt-Glaser, 1996). There is now increased emphasis on how inflammatory immune processes may influence the atherosclerotic processes (Ross, 1999). Further establishment of such links will be important because of the need to model integrative mechanisms (e.g., immune system influencing cardiovascular risk via inflammation).

Emerging advancements in social neuroscience has led to evidence suggesting higher-order neurocognitive processing involved in social processes that may provide a basis for links between social relationships and health and the neural mechanisms linked to health-relevant physiological processes (Eisenberger, 2013; Eisenberger & Cole, 2012). Given that much of the evidence is centered on areas of the brain that are associated with threat and safety responses, studies that examine this link within the context of ambivalent relationships are needed. Likewise, recent advancement in genetics implicate gene polymorphisms (Way & Taylor, 2010) and gene expression (Cole, 2009; Slavich & Cole, 2013) as potentially important avenues of future research. Such future investigations may help identify individuals who are most prone to the negative influences of ambivalent relationships and how such processes are associated with a cascade of biological changes that ultimately compromise health.

If ambivalent relationships are associated with stress enhancement, we must consider biological mechanisms in the context of exposure, reactivity, recovery, and restoration (Hawkley & Cacioppo, 2004). The current evidence on ambivalent relationships has focused primarily on exposure and reactivity; less is known about recovery and restoration. The extent of a relationship's effect on a biological mechanism may depend on the extent of one's exposure. Although we have consistent self-report data indicating significant social contact with ambivalent relationships and that these relationships are maintained among long-term relationships, we have less data using experience sampling methods. Likewise, longitudinal studies of how these relationships are maintained over time may provide stronger evidence of time course of exposure. Current research has primarily focused on reactivity, or the magnitude of response to stress. However, the data on reactivity have been isolated to cardiovascular functioning (primarily BP); future research needs to expand to other health-relevant physiological processes.

Recovery and restoration processes must also be acknowledged to fully understand the health implications of ambivalent relationships. Recovery, or the duration of response to stress, may be just as important as the magnitude of response to stress in predicting risk (Larsen & Christenfeld, 2011; Trivedi, Sherwood, Strauman, & Blumenthal, 2008). For instance, hemodynamic recovery to stress was predictive of cardiovascular risk (Ottaviani, Shapiro, Goldstein, & Mills, 2007). Thus, factors that accelerate or slow the rate of recovery may convey risk or protection. For instance, experimentally induced positive emotions accelerate cardiovascular recovery from stress (Brummett, Boyle, Kuhn, Siegler, & Williams, 2009; Fredrickson & Levenson, 1998; Fredrickson, Mancuso, Branigan, &

Tugade, 2000; Tugade & Fredrickson, 2004), whereas hostility (Vella & Friedman, 2009), depression (Key, Ross, Bacon, Lavoie, & Campbell, 2009; Salomon, Clift, Karlsdottir, & Rottenberg, 2009), and neuroticism are associated with a slower recovery. Given some evidence that ambivalent relationships are less predictable (Holt-Lunstad & Clark, 2014), it is possible such relationships may be associated with greater ruminative thinking, which may also result in slower recovery from stress (Key, Campbell, Bacon, & Gerin, 2008).

Prior research showing that a pattern of high task-related autonomic reactivity and quick recovery was associated with lower carotid artery atherosclerosis (Heponiemi et al., 2007) highlights the importance of assessing recovery in future research on ambivalent relationships. Restoration, or anabolic processes, promotes growth or replenishes physiologic reserves. For instance, sleep is thought to be a restorative process, and sleep duration and quality have both been linked to stress and relationship quality; however, only one study to date has examined ambivalent relationships and sleep. Thus, we need to consider the cumulative effect of ambivalent relationships in the context of the frequency in which one is exposed to ambivalent relationships, the intensity and durations of psychological and physiological responses to interactions with ambivalent relationships, and the restorative processes that replenish reserves and fortify against future stresses (Hawkley & Cacioppo, 2004).

Development and progression of disease

Although we now have evidence to suggest that ambivalent relationships influence health-relevant physiological processes (BP, inflammation, CAC, telomere length), it is important to examine the influence of ambivalent relationship in the context of clinical development and progression of disease morbidity. To date, no known prospective epidemiological studies have specifically examined ambivalent relationships and morbidity and mortality. Epidemiological studies do indicate that negativity in social relationships is detrimental (Choi & Marks, 2011; Tanne et al., 2004). However, our model suggests that it is concurrent positivity and negativity that may be most detrimental, and it is possible the detrimental effects reported in the epidemiology studies are due to high negativity and high positivity. Although much of these data come from family members, and it is possible that these data do represent ambivalence, this possibility remains to be tested. We also have yet to establish an association between ambivalent relationships and health in clinical health settings or longitudinal community health studies. Ultimately, it is the extent to which ambivalent relationships influence quality of life, wellness, and longevity that will determine the relevance and importance of ambivalent relationships for our understanding of health.

Other broad considerations for future research

Although we believe that the SAD model provides a framework to guide future research in this area, additional broader considerations that are less explicit in the model should be taken seriously. First, although we report evidence of the deleterious health effects of ambivalent relationships, we must more thoroughly examine the possibility of any possible adaptive or advantageous qualities of these relationships. Second, the SAD model must be tested and applied using an interdisciplinary methodological approach. Third, ultimately the evidence supporting the SAD model may be applied to guide intervention efforts.

Possible adaptiveness of ambivalent relationships?.—From an evolutionary perspective, why would ambivalent relationships thrive (perhaps like weeds) despite such detrimental consequences? Is it possible that such relationships may be adaptive? Is it possible that ambivalent relationships are adaptive because they allow one to maintain access to valued resources and prevent loneliness and social isolation? Although it is difficult to experimentally test whether having ambivalent relationships is better than having no or few relationships, it may be possible to compare people who have social networks filled with ambivalent relationships with people who are socially isolated. For example, one study showed that low-income men who were in a high-conflict marriage had lower risk for mortality than never married or previously married men (Choi & Marks, 2011)—suggesting some potential benefit of a poorer quality relationship relative to no relationship. Nonetheless, additional studies would be needed to more directly test hypotheses specific to ambivalence and to begin to tease apart their relative and unique health-relevant pathways. Although both have been linked to detrimental outcomes, we have a much larger body of evidence for the detrimental influence of social isolation and loneliness. Expanded research efforts are needed to begin to answer these questions.

Methodological approach.—As evidenced from preliminary data, it will be important to take an interdisciplinary multimethod/level approach to understanding the antecedents, processes, and consequences of ambivalent social relationships. We must take both a relationship science perspective (individual or dyad as the level of analysis) as well as a social network perspective (network level of analysis). The social relationships and health literature span many disciplines. In an effort to advance the broader science of understanding the association between social relationships and health, ambivalence needs to be integrated into existing theoretical and methodological approaches across these disciplines. This model needs to be broad enough to be relevant to those engaged in relationship science, biological sciences, medicine, epidemiology, and public health to guide future research in this area. This would allow researchers to simultaneously model multiple pathways and processes in the SAD model that would allow for stronger inferences.

Developing intervention approaches.—We believe our model provides a more comprehensive approach to understanding links between social relationships and health and has implications for intervention attempts. One important insight is that more complex relationships such as ambivalent ties, despite their positivity, tend to be associated with worse health outcomes. In addition, such ambivalent ties make up a relatively large portion of important network members across different domains such as spouses, friends, coworkers, and other family members (Campo et al., 2009; Uchino et al., 2004). Data generated from this model thus suggest that intervention attempts need to be (a) specific to social relationships and (b) effective across diverse social network ties that differ in their underlying positivity and negativity. In this context, general cognitive-behavioral stress management may not be as effective because it is not specific to relationships. Furthermore, more focused relationship therapy (i.e., marital) may be too narrow given the diversity of types relationships and social roles involved.

Given prior data suggesting ambivalence relationships are closely maintained as well as the physiological consequences of these ties even when not physically present, interventions may need to go beyond interpersonal coping strategies and instead focus on increasing positivity and decreasing negativity within a relationship. A promising set of interventions based on meditation practices from the Buddhist tradition attempts to cultivate nonjudgmental awareness, openness, and acceptance (Grossman, Niemann, Schmidt, & Walach, 2004) and could potentially be applied to relationships. Loving-kindness meditation (LKM; Kok et al., 2013) specifically focuses on relationships and seeks to increase feelings of love, caring, and compassion for the self and others—including more conflicted relationships (Salzberg, 1995). LKM's focus on relationships makes it a distinct form of mediation, and studies suggest differential mechanisms might be operating between LKM and mindfulness meditation, such as increased feelings of social connectedness and positive affect compared with more basic mechanisms of attentional control (e.g., decreased rumination; Feldman, Greeson, & Senville, 2010; Hofmann, Grossman, & Hinton, 2011; Kok et al., 2013; Lee, Rogge, & Reis, 2010). Although meditation interventions have been related to positive outcomes (Chiesa & Serretti, 2009; Grossman et al., 2004; Hofmann, Sawyer, Witt, & Oh, 2010; Piet & Hougaard, 2011) future research is needed to determine whether interventions might be effective in both reducing perceptions of ambivalence and health outcomes.

Conclusion

Much of the prior research on social relationships and health has assessed only one dimension (typically positivity or social support). Even in studies in which both dimensions were assessed, researchers have typically examined the effects of one dimension while ignoring or statistically controlling for the other (e.g., Finch & Zautra, 1992; Fiore et al., 1983). According to the model presented in Figure 2, however, high negativity includes both social aversion and social ambivalence, whereas high positivity includes both social support and social ambivalence. This point may be especially important to consider in developing effective social support interventions. Our results suggest that implementing an intervention aimed at increasing social contact or support without consideration of the extent of the joint positivity and negativity within that relationship may have unintended negative consequences. Furthermore, by focusing on increasing the positivity and decreasing the negativity, interventions may have larger effects than previously estimated. Current models of social relationships need to be expanded to incorporate the measurement of joint positivity and negativity. The SAD model provides a framework to guide future research aimed at a multidimensional approach to better understand the underlying associations between social relationships and morbidity and mortality.

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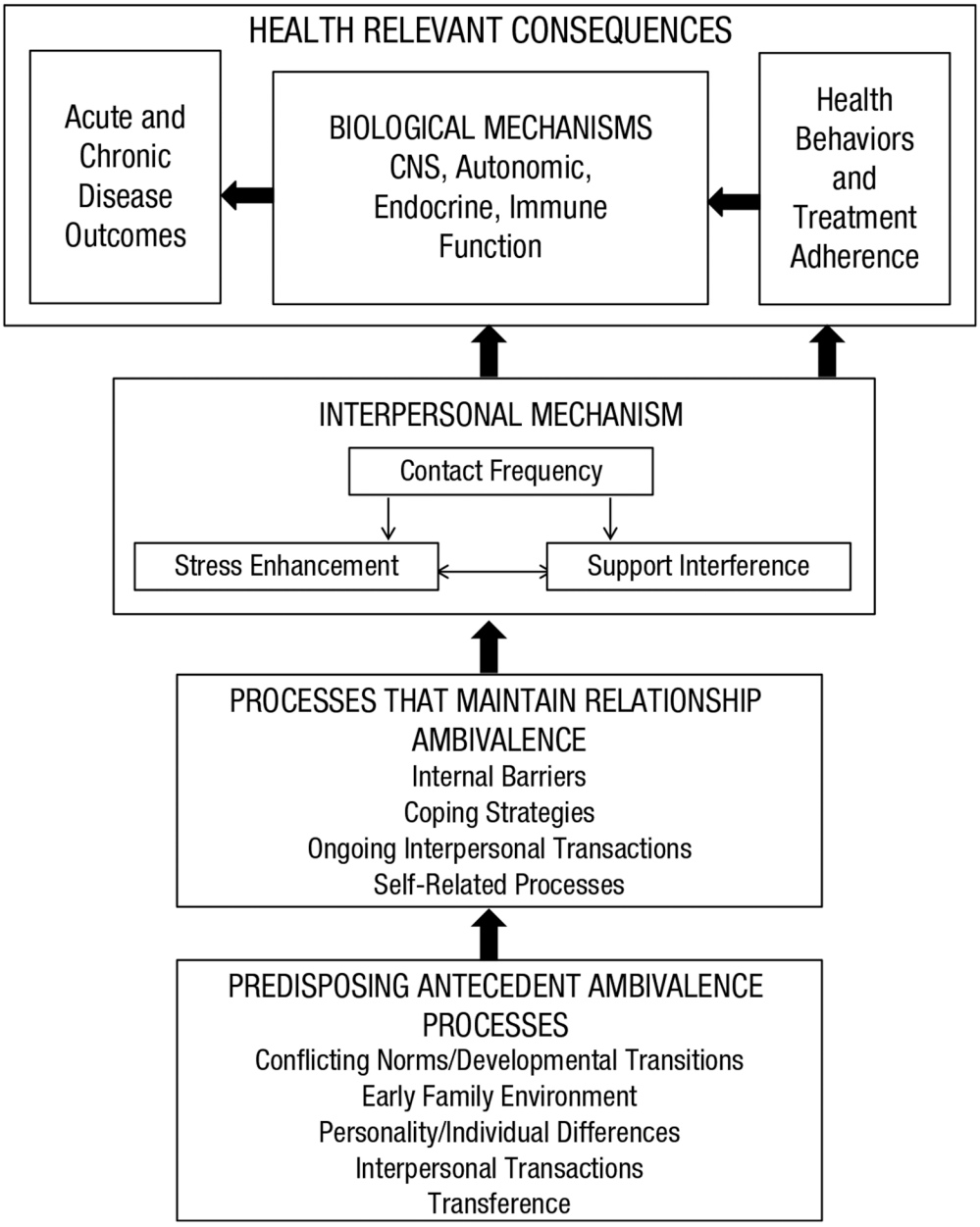

Fig. 1.

Social ambivalence and disease (SAD) theoretical model of the health implications of ambivalent relationships.

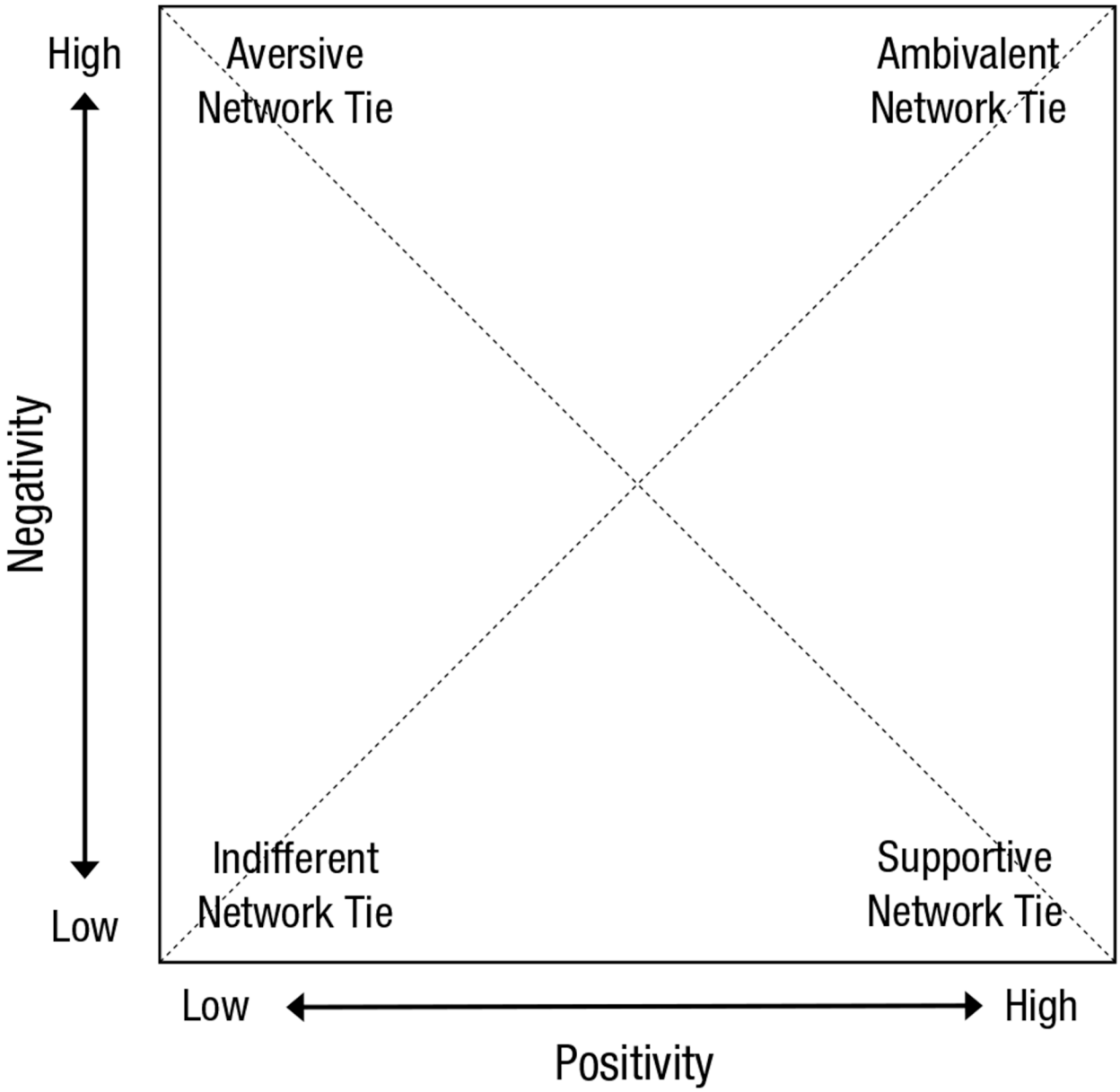

Figure 2.
Model of social relationships incorporating their positive and negative aspects (Uchino, Holt-Lunstad, Uno, & Flinders, 2001).