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Supportive communication is associated with markers of immunocompetence

Kory Floyd [a], Perry M. Pauley[b], Colin Hesse[c], Jen Eden[d], Alice E. Veksler [e], and Nathan T. Woo[a]

[a]Department of Communication, University of Arizona, Tucson, Arizona, USA; [b]Church Divinity School of the Pacific, Berkeley, California, USA; [c]Department of Speech Communication, Oregon State University, Corvalis, Oregon, USA; [d]School of Communication and the Arts, Marist College, Poughkeepsie, New York, USA; [e]Department of Communication Studies, Christopher Newport University, Newport News, Virginia, USA

ABSTRACT

Previous studies have determined that the perception or receipt of social support is correlated with several health outcomes including enhanced immunocompetence. In comparison, fewer studies have examined the effects that the expression of social support has on individuals. Among those studies that have assessed the expression of support, most have examined the deleterious effects on personal health associated with providing long-term care for a partner with a serious illness. On the basis of affection exchange theory, the present study examined the hypothesis that, in non-distressed relationships, the expression of support is associated with immunological health. Thirty-nine healthy adults completed questionnaires designed to assess their levels of expressed and received social support. Afterward, all participants completed a blood draw to assess immunological outcomes. The expression of support was positively associated with six of eight immunological outcomes assessed. Additional analyses revealed that four of those relationships remained significant while controlling for the effects of received support. The results add to our understanding of the dyadic processes involved in the expression of social support and confirm affection exchange theory's assertion that the expression of support is beneficial to individuals' relational and physical health.

KEYWORDS

Social support; health; immunocompetence; affection exchange theory

Scholars have long been interested in the benefits that supportive relationships confer upon their members. Previous studies in this domain have linked supportive relationships with low stress arousal (Bolger, Zuckerman, & Kessler, 2000; Christian & Stoney, 2006; Glynn, Christenfeld, & Gerin, 1999; Grewen, Girdler, Amico, & Light, 2005; Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003), reduced levels of depression (Dehle, Larsen, & Landers, 2001), relational satisfaction in marriage (Dehle et al., 2001; Pasch & Bradbury, 1998), enhanced immune function (Cohen, Doyle, Alper, & Skoner, 2003), and overall quality of life (Helgeson, 2003; Reinhardt, Boerner, & Horwitz, 2006). Most of those studies have focused on the benefits derived from *received* support; in comparison, fewer studies have looked at the benefits associated with *expressing* support to others.

Among those studies examining expressed support, most take a resource-depletion perspective in which the expression of support is viewed as a potential risk to, or drain on, the support-giver (e.g., Esterling, Kiecolt-Glaser, Bonard, & Glaser, 1994). Recent theoretic advancements in the field have instead posited that, as a form of affectionate communication, the *expression* of support confers some of the same physiological benefits that are typically associated with the *receipt* of support (Floyd, 2006a). The purpose of this study is to examine whether the expression of supportive forms of affection is

CONTACT Kory Floyd koryfloyd@email.arizona.edu Department of Communication, University of Arizona, PO Box 210025, Tucson AZ 85721.

associated with one of the primary outcomes identified with the receipt of social support: immunological health. Given that this proposition draws from research related to both supportive communication and human affection exchange, we will review theories and empirical studies related to each of those fields. Next, we will review existing studies examining the role of social support in immune health. Finally, we will propose original hypotheses incorporating the predictions of each theoretic perspective.

Theoretic commitments

Affection exchange theory

Floyd's (2006a) affection exchange theory (AET) is a neo-Darwinian theory that argues that the exchange of affectionate messages serves the superordinate goals of survival and procreation. As with other theories that emphasize evolutionary benefits of close relationships, such as Baumeister and Leary's (1995) need-to-belong hypothesis, AET posits that the drive to form significant bonds with others is innate. From birth onward, humans engage in behaviors designed to promote long-term relationships that ensure access to necessary resources. In support of that hypothesis, Floyd (2002) found that affectionate individuals experience many psychosocial benefits over their non-affectionate counterparts. Specifically, his study found that highly affectionate individuals report fewer symptoms of stress and depression and higher levels of self-esteem, happiness, and sociability than their non-affectionate counterparts. In addition, Floyd found that affectionate individuals are significantly more likely to be involved in romantic relationships, and among all individuals in romantic relationships, affectionate individuals report higher levels of relational satisfaction than their non-affectionate counterparts.

AET (Floyd, 2006a) articulates three specific forms of affectionate interaction within its framework, the first of which is *verbal affection*. Verbal affection includes all statements that directly convey liking, love, intimacy, or appreciation for the partner or relationship. Previous studies have examined the efficacy of both written (Floyd, Mikkelson, Hesse, & Pauley, 2007; Floyd, Pauley, & Hesse, 2010) and oral (Pauley, Floyd, & Hesse, 2014) expressions of affection and found that, regardless of the communication channel, verbal expressions of affection confer psychophysiological benefits on communicators. The second form of affectionate interaction specified by AET, *direct nonverbal gestures*, includes any behaviors that "are readily associated with the expression of affection within the social community in which they are observed" (Floyd, 2006a, p. 33). In many Western cultures, common forms of nonverbal affection include hugging, hand-holding, kissing, close physical proximity, as well as empathic listening (Floyd, 2014). As with verbal expressions of affection, previous studies have demonstrated that nonverbal forms of affection such as close physical proximity (Grewen et al., 2005) and hand-holding (Coan, Schaefer, & Davidson, 2006) can alleviate the effects of stress as well as bolster relational satisfaction and commitment (Horan & Booth-Butterfield, 2010). The final form of affectionate expression identified by AET, the *expression of support*, includes any behavior designed to provide emotional or tangible assistance to another. Such acts often require the greatest effort on the part of the sender and have the highest likelihood of misinterpretation on the part of the receiver (Floyd, 2006a). For example, a husband might choose to complete his wife's chores as a sign of his affection for her, but his wife might fail to notice his efforts or attribute them to some other factor (e.g., impatience). Likewise, digital forms of expressing affection have inherent risks of misinterpretation, specifically due to the lack of nonverbal cues and public nature of most online social networks (Mansson & Myers, 2011). Previous research has documented that supportive affectionate behavior is associated with lower cumulative stress loads (e.g., Floyd & Riforgiate, 2008), but as part of a relationship's overall affection exchange; there is little existing research on the links between physiological stress and supportive affection, specifically.

Models of social support

The proposition that supportive communication contributes to personal relationships is not unique to AET. For well over a century, social scientists in sociology, psychology, communication, and

related disciplines have systematically examined the role that support from close relational partners plays in people's psychosocial well-being (Cohen, Gottlieb, & Underwood, 2000). In recent history, researchers examining the outcomes associated with supportive interaction have primarily based their studies on one of two perspectives: the main effects model and the stress-buffering model. First parsed out of the existing literature by Cohen and Wills (1985), those models situate the benefits of social support in different contexts.

According to the *main effects model*, the benefits of socially supportive relationships are not context-specific. Because of their membership in social networks, individuals feel a sense of integration that promotes their physical and mental health. Cohen and Wills (1985) specifically identify immune and neuroendocrine function as two physiological areas associated with the main effects of support. In terms of psychosocial benefits, health-related decisions in domains (e.g., substance use behaviors, seeking medical care for illness) are behaviors commonly associated with the main effects approach. In addition, the main effects model asserts that close ties become a source of social capital that prevents individuals from taking unnecessary risks (Rook & Pietromonaco, 1987), indirectly promoting health and security.

The *stress-buffering model* posits that the receipt of social support is useful to recipients only in a stressful situation. Cohen and Wills (1985) specifically identify two moments in the stress response when the receipt of social support can alleviate the effects of a stressor. First, when appraising the severity of a potentially stressful situation, individuals might take stock of their social capital to determine whether they have sufficient resources to deal effectively with the stressor. Second, after determining that a situation is indeed stressful, individuals actively seek support from members of their social network when they experience psychophysiological symptoms of stress. Regardless of the specific type of stressor they are facing, the net result of both stress-buffering scenarios is identical: When individuals feel they have sufficient support, the psychological and physiological symptoms of stressful events are effectively minimized.

Receiving and expressing support

AET (Floyd, 2006a) and the social support models of Cohen and Wills (1985) agree that social support confers psychophysiological benefits upon the receiver, particularly when the recipient of those messages is experiencing some type of distress. Such support can occur in a variety of day-to-day life contexts, ranging from intimate relationships to fully computer-mediated online support groups (Braithwaite, Waldron, & Finn, 1999; Rini, Schetter, Hobel, Glynn, & Sandman, 2006). Priem and Solomon (2015) experimentally manipulated participants to experience stress. After participants complete a gauntlet of stressful tasks, their real-life dating partners either gave them emotionally supportive messages or did not. Saliva samples were taken before and after the stressful tests in order to measure changes in cortisol as an indicator of stress. Not only did participants have faster stress recovery rates when their partners were supportive but this change was more pronounced for those participants who self-reported favoring emotional support during the pretest questionnaire than those participants who did not highly favor emotional support. Indeed, it is no surprise that social support is beneficial, but the extent to which individuals favor specific types of social support and receive a matching form of support can bolster the beneficial effects.

The quality and extent to which supportive messages are tailored to an individual can also change how much support people perceive to feel. Despite that individual differences exist, be it due to specific personality or more broader demographic reasons, these factors do not significantly alter the effect of the overall person-centeredness of messages. The greater the person-centeredness, the more the supportive messages both legitimize the uncomfortable feelings and seek to help the individual either remedy the situation or explain it in a more appropriate manner. Ultimately, the more person-centered a supportive message is, the more helpful the receiver perceives it to be (Burleson, 2008). A meta-analysis supported the positive effects of person-centered messages and social support, both in

terms of perceived and actual effectiveness (High & Dillard, 2012). The effect of supportive messages should not be ignored.

For those with physical disabilities, instrumental social support is an ongoing issue in terms of both obtaining physical assistance when needed as well as managing and dealing with moments of support when it is not called for. When dealing with the latter, social support becomes a burden and negative experience from the perspective of those who are physically disabled (Braithwaite & Eckstein, 2003). Although it may be true that social support is often viewed as something positive to express, it is important to consider how the specific type of support may be perceived by the recipient as either appropriate or inappropriate.

Recently, Priem and Solomon (2018) conducted another experiment that sought to compare participants' subjective self-reported change of emotional improvement after receiving support against their objective, physiological data from salivary cortisol. While some elements of support were positively associated with improved recovery that is in line with the literature, two components of support (i.e., explicitness and elaboration) were not. That is, support explicitness and elaboration were associated with slower cortisol recovery, not faster. These findings suggest that measuring objective outcomes of physiological change on support may be more accurate than the participants' self-reported perceptions, ultimately making the argument for more research in this area to be done.

The social support models of Cohen and Wills (1985) and Floyd's (2006a) AET differ somewhat in the way they address the expression of supportive communication, however. Whereas Cohen and Wills (1985) offer no specific prediction about communicating support to others, AET specifically argues that conveying support to others confers benefits on the sender of these messages. Within the framework of that theoretical claim, Floyd (2006a) argued that the benefits of expressing affection are tied to several systems within the body that regulate stress responses, cardiovascular output, and endocrine functioning. The expression of affection confers benefits on communicators beyond those obtained from the receipt of affection. In a reanalysis of the data obtained for the aforementioned study examining the psychosocial benefits of affectionate interaction (Floyd, 2002), Floyd et al. (2005) reported that the expression of affection in and of itself produced many of the same benefits. In that study, Floyd et al. examined the links between expressed affection and mental and relational health outcomes. Expressed affection was negatively associated with levels of stress, depression, and relational anxiety and positively associated with levels of happiness, self-esteem, and relational satisfaction.

Physiological studies have confirmed the significance of expressed affection, as well. Floyd (2006b) reported that expressed affection was associated with stronger diurnal regulation in cortisol, a hormone commonly implicated in the stress response. Likewise, Floyd et al. (2007b) found that the expression of verbal and supportive affection was inversely related to resting heart rate. In a pair of experimental studies (Floyd et al., 2009, 2007), Floyd and colleagues reported that increases in expressed affection were associated with lower levels of blood lipids when compared to controls who maintained their current levels of affectionate interaction. Whereas other studies have found affectionate communication to potentially increase the likelihood of different illnesses and health problems (e.g., Floyd, Hesse, Boren, & Veksler, 2014), the benefits of expressing affection should not go unacknowledged.

Social support and immune health

Despite the claims of AET and the empirical support for the benefits of expressed affection, relatively few studies have directly analyzed the benefits of communicating support in close relationships (Floyd et al., 2007b being a notable exception). In comparison, several studies have examined benefits of received support ranging from quality of life (Helgeson, 2003) to specific physiological measures of stress arousal (Grewen et al., 2005). From that body of literature, studies examining the relationship between social support and immunity have largely supported the claim that received

support boosts immune system functioning (Cohen & Herbert, 1996) and are of greatest interest to the present study.

Social relationships and the immune system

Examining the role that social relationships play in immune health has been the focus of numerous studies in recent decades. Those studies have revealed that positive and fulfilling social relationships can provide a significant boost to total immunity; however, relationships that are dissatisfying or stressful often place a significant strain on immune functioning. Research by Kiecolt-Glaser and colleagues investigating the role of communication behaviors in marriage provides an excellent example of this apparent disconnect. Numerous studies indicate that individuals in satisfying marriages have longer life expectancy and greater chances of recovery from serious illness than their unmarried or unhappily married counterparts (for review, see Robles & Kiecolt-Glaser, 2003), and the explanation most commonly offered for those health advantages is the supportive nature of satisfying spousal relationships. Indeed, Kiecolt-Glaser et al. (1987) reported that recently divorced individuals experienced higher levels of depression and lower immune responsiveness when compared to married peers. Among the married individuals in the sample, marital quality was inversely related to measures of depression and immunity. The link between spousal relationship quality and immune health is even apparent in situations when marital conflict is the focus of the analysis. Kiecolt-Glaser et al. (1997) found that spouses with high levels of immunocompetence exhibited far fewer negative behaviors during conflict than their immunocompromised peers, a difference that remained statistically significant when accounting for factors such as age, gender, and use of hormone replacement therapy.

Studies examining the effects of social support on immunological health have primarily taken two approaches—assessing structural support (overall size and density of social network) and assessing functional support (the need that support meets)—that closely align with the main effects and stress-buffering models identified by Cohen and Wills (1985). Uchino, Cacioppo, and Kiecolt-Glaser (1996) conducted a meta-analysis of 19 published studies that examined the relationship between social support and immunity. Overall, 12 of those studies indicated that social support was positively associated with some aspect of immunological health, and of those studies investigating functional measures of support (n = 9), the average effect size was r = .21. Since this meta-analysis was conducted, research investigating the effects of different types of support on immunological outcomes has continued. In the following sections, we review research on specific markers of immune function that show relationships with received support.

Immunoglobulins

Immunoglobulins are components of specific cellular immunity that are produced by B cells in response to pathogen invasion (Segerstrom & Miller, 2004). Immunoglobulins, also known as antibodies, come in five varieties: immunoglobulins A, E, G, M, and D. Studies investigating the relationship between social support and immunoglobulin response have focused primarily on immunoglobulins A, G, and M.

Immunoglobulin A (IgA) is commonly found in regions of the body that produce and secrete mucous, a fact which has led some scholars to pronounce IgA the body's "first line of defense" against pathogen invasion (Underdown, 1998). Jemmott and Magloire (1988) investigated the effects of school-related stressors and social support on college students' salivary levels of IgA. IgA levels were lowest during stressful periods of the school year, an indication that stress led to significant decrements in IgA production. Moreover, regardless of the amount of stress, students receiving high levels of social support had consistently higher levels of IgA than peers whose levels of social support were inadequate. Those findings lend support to the perspective of the main effects model, namely that the perception of support availability in and of itself confers health advantages on individuals irrespective of the presence of stressors.

Immunoglobulin G (IgG) is the most common antibody in humans, accounting for nearly 75% of total antibody concentrations (Painter, 1998). IgG binds to antigens and aids in the initiation of several immune processes, including antibody synthesis. Pressman et al. (2005) analyzed the effects of social network size, loneliness, and stress on a variety of health-related outcomes that included antibody production in response to an influenza vaccination. Overall, individuals with medium (13–18 individuals) and large (19–20 individuals) social networks mounted a greater antibody response than did individuals with small (4–12 individuals) ones. Likewise, individuals with low levels of loneliness mounted greater antibody response than did individuals with moderate or high levels of loneliness. Pressman et al. noted that the relationship between social network size and antibody production was completely unaffected by loneliness and other psychological factors, suggesting that the immunocompetence associated with large social networks is effective irrespective of other psychosocial variables.

Immunoglobulin M (IgM) helps to clear the bloodstream of foreign material and is one of the first immunoglobulins to respond to antigen invasion (Casali, 1998). Gallagher, Phillips, Ferraro, Drayson, and Carroll (2008) investigated the relationships among life stress, total network support, and IgM production in response to five varieties of pneumococcal vaccination. For one of the pneumococcal strains, all three types of support assessed (tangible, emotional, and affectionate) were positively associated with IgM proliferation five days following the vaccine. Additional analyses revealed that only one type of support, tangible support, was positively associated with IgM proliferation to one of the strains at posttest. The authors found no associations between life stressors and IgM production.

Lymphocytes

Lymphocytes (commonly referred to as T and B cells) are the components of specific immunity that are responsible for mounting reactions to the presence of pathogens in the bloodstream (Segerstrom & Miller, 2004). T cells come in two varieties: Helper T cells activate other components of specific immunity, whereas cytotoxic T cells attack invading cells. B cells are primarily responsible for the production of antibodies. The surfaces of all lymphocytes are covered in complex molecular structures collectively known as the cluster of differentiation (CD). Identifying the CD structure present on the surface of lymphocytes permits researchers to distinguish between and quantify the specific lymphocytes in a sample.

T cells possessing three specific CD molecules (i.e., CD3+, CD4+, and CD8+) have received a majority of the attention given to immunity in psychosocial research. CD3+, one of the first specific T cells isolated by microbiologists, is an undifferentiated T cell that is primarily responsible for identifying pathogens as they are introduced into the bloodstream (Tunnacliffe, 1998). CD4+ is one of the primary T helper cells in the immune system and is commonly utilized in psychophysiological research as a proxy for helper total T cell activity (Segerstrom & Miller, 2004). The last T cell of note, CD8+, is one of the principal cytotoxic T cells responsible for dissolving pathogens (Weber & Cantor, 1998). The other major subclass of lymphocytes, B cells, includes CD19+ and other immune cells whose primary responsibility is the production of pathogen-specific antibodies (Segerstrom & Miller, 2004).

Empirical studies investigating the role of social support on lymphocyte production have largely confirmed that supportive interaction is positively associated with lymphocyte counts. Thomas, Goodwin, and Goodwin (1985) found a positive correlation between social support and total lymphocyte production. Goodkin et al. (1998) examined the effects of a bereavement support group on immunological and psychological outcomes in a population of homosexual men who had recently experienced the loss of a close friend or romantic partner to HIV infection. Approximately two-thirds of the participants (n = 74) in the study were themselves HIV-positive, a significant fact given the role that CD4+ helper T cells play in HIV infection (Sekaly & Rooke, 1998). Results revealed that HIV-positive participants who completed the 10-week support group experienced no significant change in levels of CD4+ cells for six months post-intervention. In

comparison, HIV-positive participants in the control group experienced a significant reduction in CD4+ count. It is also worth noting that HIV-negative participants actually experienced an *increase* in CD4+ counts following the support group intervention.

Natural killer cells

Natural killer (NK) cells are a subset of lymphocytes that do not require previous exposure to pathogens to function (Smyth et al., 2005). NK cells constitute 5% to 15% of all lymphocytes in the bloodstream (Whiteside & Herberman, 1995) and function via a process known as *apoptosis*, wherein they release proteins that kill infected cells (Smyth et al., 2005). Although several studies have investigated the effects of psychological stress on NK cell functioning (see Zorrilla et al., 2001, for a meta-analytic study), relatively few have investigated the effects of social support. Miyazaki et al. (2003) conducted one such analysis in which they compared the effects of social network size, network utilization, and received support on NK cell production. Of these three indices of social support, only perceived social support was positively and significantly associated with NK cell production (it is worth noting that the other measures of social support were positively albeit nonsignificantly associated with NK cell production).

Hypotheses

The hypothesis that perceived (or received) support enhances immune function has received rather robust support in the literature. Given the relationships between social network health and immune health, we propose the following:

H1: Received support is positively associated with immunocompetence.

In comparison, the effect of the *expression* of support on immune health has received scant attention. At least three studies have investigated the effects of support expression; however, each of those studies examined the expression of support in the context of spousal relationships in which spouses were providing long-term care for their partners. The majority of findings in those studies indicates that the expression of support is seen as a depletion of resources, one that eventually compromises the mental and physical well-being of the caregiver. Kiecolt-Glaser, Dura, Speicher, and Trask (1991) reported that, compared to non-distressed age-matched peers, participants who provided long-term care to a spouse with dementia reported worse levels of subjective health (as indicated by number of days of illness) and experienced lower levels of antibody production. Esterling, Kiecolt-Glaser, Bodnar, and Glaser (1994) likewise reported that individuals who provided long-term functional care to a spouse with dementia experienced worse immune function than non-distressed age-matched peers; however, among the caregivers in their study, those who received emotional and tangible support from members of their extended social networks experienced significantly better immune health than those without such supports. In contrast to these previous studies, one recent study (Bristow, Cook, Erzinclioglu, & Hodges, 2008) indicated that caregivers of long-term partners with dementia experienced significantly higher levels of stress and depression than non-distressed age-matched peers; however, these groups did not differ in terms of their immune response.

To date, the expression of support in the context of normal (i.e., non-distressing) relationships has received almost no empirical attention. The results of at least one study (Cohen, Doyle, Turner, Alpert, & Skoner, 2003) suggest that supporting others through expressions of care and affection might promote health and well-being among individuals. Cohen et al. examined the relationship between total relationship health and susceptibility to the common cold in an experimental study: 334 healthy adults were exposed to one strain of the human rhinovirus and were assessed at five days and one month post-exposure for signs of illness. Results demonstrated that sociability, a composite

index consisting of extraversion, agreeableness, and positive relationship style, was negatively associated with the development of cold symptoms. This measure of sociability included the Positive Relationships With Others Scale (Ryff, 1989), an index of "warm, satisfying relationships with others" designed to assess the degree of "strong empathy, affection, and intimacy" (p. 1072) individuals communicate in their close relationships. Given the similarity between that measure and many of the behaviors identified by Floyd's (2006a) AET, it stands to reason that supportive, empathic, affectionate relationships play a significant role in boosting total immune health. Although studies have not yet directly tested AET's prediction that the communication of supportive (and other forms of) affection is positively associated with immune functioning, the inclusion of this specific measure in Cohen et al.'s conceptualization of sociability suggests that immunocompetence is significantly associated with supportive behavior *as a component of affectionate communication*.

H2: The expression of supportive affection is positively associated with immunocompetence.

As mentioned previously, one of the claims of AET (Floyd, 2006a) is that the expression of affection (including the expression of social support) confers psychophysiological benefits upon communicators above and beyond the effects of received affection. Empirical studies have largely confirmed that claim. Results consistently reveal that, controlling for the amount of affection individuals receive from significant relational partners, the benefits of expressing affection are positively associated with psychological and physiological benefits (Floyd, 2006b; Floyd et al., 2005, 2007b). Although previous studies have not investigated the relationship between the expression of affection and immune outcomes, AET's position on the benefits of expressed affection and the consistency of the empirical results investigating this claim lead to the following hypothesis:

H3: Controlling for the benefits of received support, the expression of supportive affection is positively associated with immunocompetence.

Method

Participants

A total of 39 healthy adult participants (23 women) participated in the present study. Participants' mean age was approximately 27 years (M = 26.97, SD = 9.01, range: 20–58 years) at the time of the study. The majority was Caucasian (62.3%) followed by Asian/Pacific Islander (20.8%), Hispanic/Latino (7.5%), African American (1.9%), and participants of other ethnic origins (1.9%). In terms of educational attainment, the majority of participants held a college degree. Overall, 14 participants (35.9%) had completed some college but earned no degree, 12 (30.77%) had earned either an associate's or bachelor's degree, 9 (23.08%) held a master's degree, 2 had only a high school diploma (5.13%), and 1 participant did not indicate his or her education level. Based on previous research connecting immunological outcomes with affectionate behavior (Floyd et al., 2014, 2014), we anticipated moderate effect sizes ($r \cong .40$), and a power analysis using G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009) indicated that a sample of 39 provides 85% power for detecting a medium effect size at a .05 probability level.

Procedures

Participants were recruited from the university community of a large urban campus in the southwestern United States. Recruitment announcements were distributed via electronic advertisements posted in the classified section of the campus online newspaper as well as through email distribution lists. A total of 211 individuals replied to the recruitment announcement and completed an initial prescreening

questionnaire. On the basis of responses to that questionnaire, 78 (36.9%) met all eligibility requirements. Men and women were equally likely to be qualified for the study ($p > .05$). All eligible participants received an invitation to participate in the study, and from the pool of qualified candidates, 39 (18.5% of prospective participants, 50% of qualified participants) completed the study. All procedures for the study were reviewed and approved by the university's institutional review board.

Inclusion and exclusion criteria

To be eligible for the study, prospective participants had to (a) be 18 years of age or older; (b) be able to speak and read English; (c) weigh at least 110 pounds; (d) be normotensive; (e) report no history of diagnosis or treatment for asthma, AIDS, type I or type II diabetes mellitus, cancer of any form, lupus, Crohn's or Graves' disease, hepatitis, multiple sclerosis, rheumatoid arthritis, or clinical depression; (f) report no current use of anticoagulants; (g) report that they were not currently pregnant or breastfeeding; and (h) report no more than mild anxiety about venipuncture. The most common reasons for disqualification were a history of asthma and/or clinical depression.

Pre-laboratory questionnaire

Qualified participants were directed to complete an online questionnaire published on a commercial data collection website (SurveyMonkey.com) prior to their scheduled laboratory appointment. The questionnaire contained measures of participants' social and emotional health, personality traits, relationship quality, health-related behaviors, and demographic characteristics.

Laboratory procedures and instrumentation

Laboratory sessions occurred in the university's Clinical Research Center. Upon arrival, participants were consented by a research assistant and then evaluated by a registered nurse (RN) for height, weight, and resting pulse rate. Observing universal precautions, the RN collected 8.5 ml of whole blood for the biochemical assays. Blood samples were drawn into evacuated glass tubes (Vacutainer; Becton Dickson, Franklin Lakes, NJ, USA). Researchers prepared the samples as directed and shipped them via overnight delivery to Pharmasan Labs, a professional Clinical Laboratory Improvement Amendments-certified service laboratory in Osceola, WI. Following venipuncture, the RN bandaged each participant while researchers offered participants juice and cookies. Participants were observed for a period of approximately five minutes after the conclusion of the blood draw and released. Each participant was paid $15 in exchange for taking part in the study.

Measures

Expressed support was measured using the five-item social support subscale from the Affectionate Communication Index (ACI; Floyd & Morman, 1998). The ACI is an 18-item measure with statements related to each of the three types of affectionate communication identified by AET (Floyd, 2006a). The ACI consists of a series of affectionate behaviors. Participants are instructed to indicate how often they engage in each behavior on a scale of 1 (*never*) to 7 (*often*) with a specific relational partner. The supportive communication subscale contains items related to sharing personal information, helping the relational partner with problems, and praising the relational partner's accomplishments. In the present study, reliability for the five-item supportive communication subscale was $\alpha = .77$.

Received support was measured using a 12-item version of the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet, Dahlem, Zimet, & Farley, 1988). The MSPSS is a measure of perceived global social support that includes items related to family, friend, and romantic partner support. For each item, participants are asked to indicate how much they agree with each of the supportive statements listed. Sample items include "There is a special person who is around when I am in need," "I can talk about my problems with my family," and "I can

count on my friends when things go wrong." In the present study, reliability for the 12-item measure was $\alpha = .90$.

Biochemical measures

Assays for NK cell cytotoxicity, CD molecules, and immunoglobulins A, G, and M were performed by Pharmasan Labs. Standardized biochemical assay procedures were followed for all chemical agents (bioassay details available on request). Cytotoxicity results are expressed in lytic units; immunoglobulin results are expressed in mg/dL; and CD results are expressed in cells/μl. Inter- and intra-assay coefficients of variation were < 10%, indicating strong reliability.

Results

Descriptive statistics

Means and standard deviations for each outcome measure appear in Table 1. Preliminary results demonstrated that expressed and received support were strongly correlated, r (38) = .66, $p < .001$. Women ($M = 6.41$, $SD = .62$) indicated higher levels of support expression than men ($M = 5.73$, $SD = 1.16$), t (36) = −2.35, $p = .025$; however, there were no differences between men ($M = 5.35$, $SD = 1.35$) and women ($M = 5.84$, $SD = .74$) in regard to perceptions of support availability, t (36) = −1.46, $p = .15$.

Hypothesis tests

Hypothesis one predicted that perceived social support is positively correlated with immunological health. Overall, we found mixed support for H1. Of the eight immunological outcomes tested, three—IgM, CD3+, and CD4+—were significantly correlated with perceived social support (all ps < .05). Four of the five remaining immunological outcomes were positively correlated with received support, but the correlations failed to achieve statistical significance. NK cells were weakly and negatively correlated with received support ($r = -.07$, $p = .33$). Correlations between received support and all immunological outcomes appear in Table 1.

On the basis of AET's (Floyd, 2006a) prediction that the communication of affection (including supportive affection) benefits providers as well as recipients, H2 predicted that the expression of support is positively associated with markers of immunological health. Results mostly supported the prediction of H2: Of the eight immunological outcomes examined in the study, six—IgG, IgM, CD3+, CD4+, CD8+, and CD19+—were significantly correlated with the expression of support. Correlations between expressed support and all immunological outcomes appear in Table 2.

Table 1. Means, Standard Deviations, and Intercorrelations for Study Variables ($N = 39$).

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. IgG	36.82	21.57	–								
2. IgM	11.56	12.39	−.06	–							
3. IgA	5.21	8.75	−.09	.17	–						
4. CD3+	1444.72	487.62	−.11	.17	.01	–					
5. CD4+	877.26	318.84	−.08	.10	.09	.89**	–				
6. CD8+	532.18	243.77	−.08	.27	.01	.79**	.45**	–			
7. CD19+	238.90	121.30	.14	−.05	.02	.48**	.43**	.37*	–		
8. NK cells	272.85	114.07	−.06	−.17	.35*	.17	.18	.14	.16	–	
9. Received support	5.61	1.01	.23	.31	.12	.28	.32*	.16	.17	−.07	–
10. Expressed support	6.14	0.92	.38*	.29	.06	.45**	.46**	.28	.31	−.11	.66**

Note. Immunoglobulin (Ig) results are expressed in mg/dL; cluster of differentiation (CD) results are expressed in cells/μl; natural killer (NK) cell results are expressed in lytic units; and received and expressed support are measured on 1–7 scales.
*$p < .05$. **$p < .01$ (probabilities are two-tailed).

Table 2. Correlations Between Expressed Social Support and Immunological Outcomes.

Immune outcome	Correlation	Partial correlation
IgG	.375**	.295*
IgM	.285*	.116
IgA	.058	−.087
CD3+	.454**	.418**
CD4+	.464**	.368†
CD8+	.280*	.273
CD19+	.305*	.292*
Natural killer cells	−.111	−.113

Note. Partial correlations control for the effect of received support.
*$p < .05$. **$p < .01$. †$p = .01$.
Ig = immunoglobulin; CD = cluster of differentiation.

Given that AET posits that the expression of affection is beneficial to communicators above and beyond the benefits of receiving affection alone, H3 predicted that the relationship between expressed support and immunological health is significant when controlling for the benefits of received support. Results of the present analysis revealed partial support for the prediction of H3 as four of the immunological outcomes examined—IgG, CD3+, CD4+, and CD19+—were correlated with expressed support while controlling for the benefits of received support. Of the four remaining immune markers, two—IgM and CD8+—were positively correlated with expressed support and two—IgA and NK cell cytotoxicity—were negatively associated with expressed support (all *p*s < .05). Data related to H3 appear in Table 2.

For exploratory purposes, we also examined partial correlations between received support and immunological outcomes while controlling for expressed support. Correlation coefficients ranged in absolute magnitude from .02 to .17 and all were nonsignificant.

Discussion

The present study examined the relationships among perceived social support, expressed social support, and eight immunological outcomes: immunoglobulins G, M, and A; CD3+, CD4+, CD8+, and CD19+ lymphocytes; and NK cell cytotoxicity. Three immune markers (IgM, CD3+, and CD4+) were significantly correlated with the receipt of social support, but six (immunoglobulins G and M, CD3+, CD4+, CD8+, and CD19+) were positively correlated with the expression of social support. Moreover, four markers (IgG, CD3+, CD4+, and CD19+) remained positively correlated with expressed support net of the effects of received support. In the following sections, we will discuss the theoretic ramifications of these findings, address some of the strengths and limitations of this research, and offer some qualified conclusions along with potential directions for future investigations.

Theoretic implications

In terms of the benefits associated with the receipt of social support or the perception of support availability, the present study tested the stress-buffering approach toward understanding socially supportive interaction. Specifically, we examined the hypothesis that "social support is beneficial because network members may provide us with the resources to avoid or reduce our exposure to some types of negative life events" (Uchino, 2004, p. 35). Given that previous studies have indicated a strong and consistent link between functional measures of support and immune health (Uchino et al., 1996), we were somewhat surprised that perceptions of support were only modestly correlated with immune health in the present study. At least two explanations can be offered for the apparent inconsistency in the present study. First, it is worth noting that the results of the present study are not inconsistent with some studies (including several reviewed earlier) investigating the link between immune health and social support. Indeed, at least one previous study determined that only some

immunologic outcomes were associated with the perception of support (Gallagher et al., 2008), whereas other studies have found that only certain types of support are positively associated with immune function (Miyazaki et al., 2003). In theoretic terms, the fact that only certain kinds of support are associated with some (but not all) immunologic outcomes could be explained by a concept known as support matching (Uchino, 2004). The support-matching hypothesis argues that support is effective only when it meets recipients' perceived needs. So, if support recipients desire esteem support but providers offer emotional or tangible support, those supportive acts will be deemed unhelpful despite the providers' best intentions. Given that the present study included no measures related to the expression of different forms of support and did not assess participants' satisfaction with the quality of support received, it is certainly plausible that, despite the efforts and intentions of members of their social networks, participants in the present study felt that their support needs were not satisfied. Future studies could investigate the discrepancy between desired and received support levels, a concept that has received some empirical attention (e.g., Dehle et al., 2001).

A second possible explanation is that the participants' reception of support was not in line with the level of stress they experienced. Uchino (2004) and others have argued that the stress-buffering effects of support are particularly salient when perceptions of life stress are high. By extension, this model of stress buffering could mean that there are floor effects for stress such that individuals' perceived stress levels must meet a certain threshold to activate the stress-buffering effects of received support. At least one recent study found an interaction effect between social support and life stressors in immune system responsiveness. In a study of women dealing with stage IV breast cancer, Turner-Cobb et al. (2004) found that social network size moderated the effect of stressful life events on immune system reactions. Among women with relatively small social networks, life stressors were negatively associated with immune system responsiveness; however, among women with larger social networks, life stressors were positively associated with immune system reactivity. Burleson's (2009) dual-process model of support provides one theoretic lens through which these effects can be interpreted. According to the dual-process model, the salience and severity of stressful life events increase individuals' willingness to attend to supportive communication from members of their social network. As such, situations where support levels are sufficient and stress levels are high are those most likely to produce strong effects for perceived social support.

Expressions of support

Previous studies that have investigated the effects of expressed support have primarily examined support expression in the context of long-term care for a loved one with a serious illness. Not surprisingly, the majority of those studies determined that the expression of support is associated with relatively poor immune functioning (Esterling et al., 1994; Kiecolt-Glaser, Dura, Speicher, & Trask, 1991). In the present study, we tested the immunological correlates of expressed support in the context of non-distressed relationships. Within such a context, AET posits that the exchange of affectionate messages stimulates physiological pathways that enhance communicators' overall health. One of the most consistent findings in studies analyzing the effect of affectionate communication on physiological health outcomes has been the role that affectionate interaction can play in mitigating the stress response (Floyd, 2006b; Floyd et al., 2007a, 2007b; Floyd & Riforgiate, 2008; Pauley et al., 2014). Still other studies have investigated the effects of affection on blood lipid levels (Floyd et al., 2009, 2007) and hormones such as oxytocin (Floyd et al., 2010). Across those studies, results have consistently shown that the exchange of affectionate messages (particularly the *expression* of affection) confers physiological benefits upon communicators. Results from the present study likewise confirm that the expression of supportive forms of affection is positively associated with immunological health.

Analyzing the physiological benefits associated with the expression of support in non-distressed relationships is relatively novel when compared to existing research that has focused so heavily on the receipt of support. Although this approach might be unique in empirical studies, it is not unique to theoretic perspectives of supportive interaction. Goldsmith's (2004) model of social support

provides another theoretic approach that shares the interactional view of support advanced by AET. Goldsmith argues that traditional matching approaches to supportive communication like those discussed previously do not fully address all of the implications of situations that necessitate the expression of social support. According to her model, individuals work together with one another in moments of distress to define and discuss the situation in ways that are appropriate to their relationship and the context of the stressor. The net result in many of these situations is that the distinction between support provider and support recipient becomes somewhat unclear as individuals work together in a manner that facilitates shared coping. When that type of supportive encounter occurs, it is not unreasonable to expect that both individuals will leave the conversation feeling encouraged about the situation and closer to one another. In much the same way, AET argues that the expression and receipt of all forms of affectionate messages promote the formation of significant pair bonds that enhance individuals' relational, psychological, and physical health. Given that two relatively new theories place an emphasis on the communicative processes at work in supportive communication, understanding the role that both the receipt *and* expression of supportive communication play in psychophysiological and relational outcomes is an area worthy of additional study in the field of communication.

Strengths, limitations, and conclusions

Although we are encouraged that the findings from the present study advance our understanding of the role that supportive messages play in total health, these findings must be interpreted with some caution. As with all correlational studies, it is not possible to offer any meaningful conclusions about causal relationships between the variables included in the present study. As the studies reviewed earlier indicate, many studies investigating the relationship between social support and immunological outcomes rely on correlation-based analyses. Examining the hypothesis that expressions of support are positively associated with immune health in a controlled experimental study seems a logical next step for future investigations.

A second limitation was the use of different measures for expressed and received support (rather than a single operational definition that could have captured both constructs). We elected to use the MSPSS to measure received support and the supportive affection subscale of the ACI to measure expressed support because these are both validated measures with a long history of empirical use. This decision increased measurement validity and enhanced the study's ability to compare its findings to those of other investigations employing the same operational definitions. At the same time, however, we recognize that using these different measures makes the comparison of received and expressed support non-parallel, and a useful endeavor for future research would be to create and validate a complementary form of either or both measures.

As Floyd (2006a) pointed out, it is possible that benefits associated with expressing affection can be partially accounted for by the benefits of affection received in return, as the two are highly reciprocal. The same observation applies to social support, raising the possibility that within close relationships, each partner's expression of support creates an expectation that support will be rendered in return. Indeed, this is why we examined the effects of expressed support, net of the effects of received support, on immunocompetence, but future research could add significant clarity to this possibility by examining dyad-level as well as individual-level effects.

One of the central claims of AET (Floyd, 2006a) is that the exchange of affectionate messages confers tangible physiological benefits upon individuals in close relationships. Whereas other theories focus extensively on the benefits associated with receiving supportive and affectionate messages, AET extends this discussion with its claim that the *expression* of these messages is equally adaptive. As one of the first studies to examine this hypothesis as it relates to immunological outcomes, the results of the present study contribute to our understanding of the role that expressions of caring and concern play in enhancing both relational as well as physical health.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Kory Floyd http://orcid.org/0000-0002-0664-0418
Alice E. Veksler http://orcid.org/0000-0001-8731-320X

References

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*, 497–529. doi:10.1037/0033-2909.117.3.497

Bolger, N., Zuckerman, A., & Kessler, R. C. (2000). Invisible support and adjustment to stress. *Journal of Personality and Social Psychology*, *79*, 953–961. doi:10.1037/0022-3514.79.6.953

Braithwaite, D. O., & Eckstein, N. J. (2003). How people with disabilities communicatively manage assistance: Helping as instrumental social support. *Journal of Applied Communication Research*, *31*, 1–26. doi:10.1080/00909880305374

Braithwaite, D. O., Waldron, V. R., & Finn, J. (1999). Communication of social support in computer-mediated groups for people with disabilities. *Health Communication*, *11*, 123–151. doi:10.1207/s15327027hc1102_2

Bristow, M., Cook, R., Erzinclioglu, S., & Hodges, J. (2008). Stress, distress and mucosal immunity in carers of a partner with fronto-temporal dementia. *Aging & Mental Health*, *12*, 595–604. doi:10.1080/13607860802343076

Burleson, B. R. (2008). What counts as effective emotional support? Explorations of individual and situational differences. In M. Motley (Ed.), *Studies in Applied Interpersonal Communication* (pp. 207–227). Newbury Park, CA: Sage.

Burleson, B. R. (2009). Understanding the outcomes of supportive communication: A dual-process approach. *Journal of Social and Personal Relationships*, *26*, 21–38. doi:10/1177/0265407509105519

Casali, P. (1998). IgM. In P. J. Delves (Ed.), *Encyclopedia of immunology* (2nd ed., pp. 1212–1217). Oxford, England: Academic Press.

Christian, L. M., & Stoney, C. M. (2006). Social support versus social evaluation: Unique effects on vascular and myocardial response patterns. *Psychosomatic Medicine*, *68*, 914–921. doi:10.1097/01.psy.0000244023.20755.cf

Coan, J. A., Schaefer, H. S., & Davidson, R. J. (2006). Lending a hand: Social regulation of the neural response to threat. *Psychological Science*, *17*, 1032–1039. doi:10.1111/j.1467-9280.2006.01832.x

Cohen, S., Doyle, W. J., Alper, C. M., & Skoner, D. P. (2003). Sociability and susceptibility to the common cold. *Psychological Science*, *14*, 389–395. doi:10.1111/1467-9280.01452

Cohen, S., Gottlieb, B. H., & Underwood, L. G. (2000). Social relationships and health. In S. Cohen, L. G. Underwood, & B. H. Gottlieb (Eds.), *Social support measurement and interventions: A guide for health and social scientists* (pp. 3–25). Oxford, England: Oxford University Press.

Cohen, S., & Herbert, T. B. (1996). Health psychology: Psychological factors and physical disease from the perspective of human psychoneuroimmunology. *Annual Review of Psychology*, *47*, 113–142. doi:10.1146/annurev.psych.47.1.113

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, *98*, 310–357. doi:10.1037/0033-2909.98.2.310

Dehle, C., Larsen, D., & Landers, J. E. (2001). Social support in marriage. *The American Journal of Family Therapy*, *29*, 307–324. doi:10.1080/01926180126500

Esterling, E. A., Kiecolt-Glaser, J. K., Bodner, J. C., & Glaser, R. (1994). Chronic stress, social support, and persistent alterations in the natural killer cell response to cytokines in older adults. *Health Psychology*, *13*, 291–298. doi:10.1037/0278-6133.13.4.291

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*, 1149–1160. doi:10.3758/BRM.41.4.1149

Floyd, K. (2002). Human affection exchange: V. Attributes of the highly affectionate. *Communication Quarterly*, *50*, 135–152. doi:10.1080/01463370209385653

Floyd, K. (2006a). *Communicating affection: Interpersonal behavior and social context*. Cambridge, England: Cambridge University Press.

Floyd, K. (2006b). Human affection exchange: XII. Affectionate communication is associated with diurnal variation in salivary free cortisol. *Western Journal of Communication*, *70*, 47–63. doi:10.1080/10570310500506649

Floyd, K. (2014). Empathic listening as an expression of interpersonal affection. *International Journal of Listening*, *28*, 1–12. doi:10.1080/10904018.2014.861293

Floyd, K., Boren, J. P., Hannawa, A. F., Hesse, C., McEwan, B., & Veksler, A. E. (2009). Kissing in marital and cohabiting relationships: Effects on blood lipids, stress, and relationship satisfaction. *Western Journal of Communication*, *73*, 113–133. doi:10.1080/10570310902856071

Floyd, K., Hess, J., Miczo, L., Halone, K., Mikkelson, A. C., & Tusing, K. (2005). Human affection exchange: VIII. Further evidence of the benefits of expressed affection. *Communication Quarterly*, *53*, 285–303. doi:10.1080/01463370500101071

Floyd, K., Hesse, C., Boren, J. P., & Veksler, A. E. (2014). Affectionate communication can suppress immunity: Trait affection predicts antibodies to latent Epstein-Barr virus. *Southern Communication Journal*, *79*, 2–13. doi:10.1080/1041794X.2013.858178

Floyd, K., Mikkelson, A. C., Hesse, C., & Pauley, P. M. (2007). Affectionate writing reduces total cholesterol: Two randomized, controlled trials. *Human Communication Research*, *33*, 119–142. doi:10.1111/j.1468-2958.2007.00293.x

Floyd, K., Mikkelson, A. C., Tafoya, M. A., Farinelli, L. A., La Valley, A. G., Judd, J., … Wilson, J. (2007a). Human affection exchange: XIV. Relational affection predicts resting heart rate and free cortisol secretion during acute stress. *Behavioral Medicine*, *32*, 151–156. doi:10.3200/BMED.32.4.151-156

Floyd, K., Mikkelson, A. C., Tafoya, M. A., Farinelli, L. A., La Valley, A. G., Judd, J., … Wilson, J. (2007b). Human affection exchange: XIII. Affectionate communication accelerates neuroendocrine stress recovery. *Health Communication*, *22*, 123–132. doi:10.1080/10410230701454015

Floyd, K., & Morman, M. T. (1998). The measurement of affectionate communication. *Communication Quarterly*, *46*, 144–162. doi:10.1080/01463379809370092

Floyd, K., Pauley, P. M., & Hesse, C. (2010). State and trait affectionate communication buffer adults' stress reactions. *Communication Monographs*, *77*, 618–636. doi:10.1080/03637751.2010.498792

Floyd, K., Pauley, P. M., Hesse, C., Veksler, A. E., Eden, J., & Mikkelson, A. C. (2014). Affectionate communication is associated with markers of immune and cardiovascular system competence. In J. M. Honeycutt, C. Sawyer, & S. Keaton (Eds.), *The influence of communication on physiology and health status* (pp. 115–130). New York, NY: Peter Lang Publishing.

Floyd, K., & Riforgiate, S. (2008). Affectionate communication received from spouses predicts stress hormone levels in healthy adults. *Communication Monographs*, *75*, 351–368. doi:10.1080/03637750802512371

Gallagher, S., Phillips, A. C., Ferraro, A. J., Drayson, M. T., & Carroll, D. (2008). Social support is positively associated with the immunoglobulin M response to vaccination with pneumococcal polysaccharides. *Biological Psychology*, *78*, 211–215. doi:10.1016/j.biopsycho.2008.01.001

Glynn, L. M., Chistenfeld, N., & Gerin, W. (1999). Gender, social support, and cardiovascular responses to stress. *Psychocomatic Medicine*, *61*, 234–242. doi:10.1097/00006842-199903000-00016

Goldsmith, D. J. (2004). *Communicating social support*. Cambridge, England: Cambridge University Press.

Goodkin, K., Feaster, D. J., Asthana, D., Blaney, N. T., Kumar, M., Baldewicz, T., … Fletcher, M. A. (1998). A bereavement support group is longitudinally associated with salutary effects on the CD4 cell count and number of physician visits. *Clinical and Diagnostic Laboratory Immunology*, *5*(3), 382–391.

Grewen, K. M., Girdler, S. S., Amico, J., & Light, K. C. (2005). Effects of partner support on resting oxytocin, cortisol, norepinephrine, and blood pressure before and after warm partner contact. *Psychosomatic Medicine*, *67*, 531–538. doi:10.1097/01.psy.0000170341.88395.47

Heinrichs, M., Baumgartner, T., Kirschbaum, C., & Ehlert, U. (2003). Social support and oxytocin interact to suppress cortisol and subjective responses to psychological stress. *Biological Psychiatry*, *54*, 1389–1398. doi:10.1016/S0006-3223(03)00465-7

Helgeson, V. S. (2003). Social support and quality of life. *Quality of Life Research: an International Journal of Quality of Life Aspects of Treatment Care and Rehabilitation*, *12*(S1), 25–31. doi:10.1023/A:1023509117524

High, A. C., & Dillard, J. P. (2012). A review and meta-analysis of person-centered messages and social support outcomes. *Communication Studies*, *63*, 99–118. doi:10.1080/10510974.2011.598208

Horan, S. M., & Booth-Butterfield, M. (2010). Investigating in affection: An invitation of affection exchange theory and relational qualities. *Communication Quarterly*, *58*, 394–413. doi:10.1080/01463373.2010.524876

Jemmott, J. B., & Magloire, K. (1988). Academic stress, social support, and secretory immunoglobulin A. *Journal of Personality and Social Psychology*, *55*, 803–810. doi:10.1037/0022-3514.55.5.803

Keicolt-Glaser, J. K., Dura, J. R., Speicher, C. E., Trask, O. J., & Glaser, R. (1991). Spousal caregivers of dementia victims: Longitudinal changes in immunity and health. *Psychosomatic Medicine*, *53*, 345–362. doi:10.1097/00006842-199107000-00001

Kiecolt-Glaser, J. K., Glaser, R., Cacioppo, J. T., MacCallum, R. C., Snydersmith, M., Kim, C., & Malarkey, W. B. (1997). Marital conflict in older adults:Endocrinological and immunological correlates. *Psychosomatic Medicine*, *59*, 339–349. doi:10.1097/00006842-199707000-00001

Kiecolt-Glaser, J. K., Fisher, L. D., Ogrocki, P., Stout, J. C., Speicher, C. E., & Glaser, R. (1987). Marital quality, marital disruption, and immune function. *Psychosomatic Medicine*, *49*, 13–34. doi:10.1097/00006842-198701000-00002

Mansson, D. H., & Myers, S. A. (2011). An initial examination of college students' expressions of affection through Facebook. *Southern Communication Journal*, *76*, 155–168. doi:10.1080/10417940903317710

Miyazaki, T., Ishikawa, T., Iimori, H., Miki, A., Wenner, M., Fukunishi, I., & Kawamura, N. (2003). Relationship between perceived social support and immune function. *Stress and Health*, *19*, 3–7. doi:10.1002/smi.950

Painter, R. H. (1998). IgG. In P. J. Delves (Ed.), *Encyclopedia of immunology* (2nd ed., pp. 1208–1211). Oxford, England: Academic Press.

Pasch, L. A., & Bradbury, T. N. (1998). Social support, conflict, and the development of marital dysfunction. *Journal of Consulting and Clinical Psychology*, *66*, 219–230. doi:10.1037//0022-006X.66.2.219

Pauley, P. M., Floyd, K., & Hesse, C. (2014). The stress-buffering effects of a brief dyadic interaction before an acute stressor. *Health Communication*, *30*, 646–659. doi:10.1080/10410236.2014.888385

Pressman, S. D., Cohen, S., Miller, G. E., Barkin, A., Rabin, B. S., & Treanor, J. J. (2005). Loneliness, social network size, and immune response to influenza vaccination in college freshmen. *Health Psychology*, *24*, 297–306. doi:10.1037/0278-6133.24.3.297

Priem, J. S., & Solomon, D. H. (2015). Emotional support and physiological stress recovery: The role of support matching adequacy and invisibility. *Communication Monographs*, *82*, 88–112. doi:10.1080/03637751.2014.971416

Priem, J. S., & Solomon, D. H. (2018). What is supportive about supportive communication? Qualities of interaction that predict emotional and physiological outcomes. *Communication Research*, *45*, 443–473. doi:10.1177/0093650215595074

Reinhardt, J. P., Boerner, K., & Horowitz, A. (2006). Good to have but not to use: Differential impact of perceived and received support on well-being. *Journal of Social and Personal Relationships*, *23*, 117–129. doi:10.1177/0265407506060182

Rini, C., Schetter, C. D., Hobel, C. J., Glynn, L. M., & Sandman, C. A. (2006). Effective social support: Antecedents and consequences of partner support during pregnancy. *Personal Relationships*, *13*, 207–229. doi:10.1111/j.1475-6811.2006.00114.x

Robles, T. F., & Kiecolt-Glaser, J. K. (2003). The physiology of marriage: Pathways to health. *Physiology & Behavior*, *79*, 409–416. doi:10.1016/S0031-9384(03)00160-4

Rook, K. S., & Pietromonaco, P. (1987). Close relationships: Ties that heal or ties that bind? In W. H. Jones & D. Perlman (Eds.), *Advances in personal relationships* (pp. 1–35). Greenwich, CT: JAI Press.

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, *57*, 1069–1081. doi:10.1037/0022-3514.57.6.1069

Segerstrom, S. C., & Miller, G. E. (2004). Psychological stress and the human immune system: A meta-analytic study of 30 years of inquiry. *Psychological Bulletin*, *130*, 601–630. doi:10.1037/0033-2909.130.4.601

Sekaly, R. P., & Rooke, R. (1998). CD4. In P. J. Delves (Ed.), *Encyclopedia of immunology* (2nd ed., pp. 468–472). Oxford, England: Academic Press.

Smyth, M. J., Cretney, E., Kelly, J. M., Westwood, J. A., Street, S. E., Yagita, H., … Hayakawa, Y. (2005). Activation of NK cell cytotoxicity. *Molecular Immunology*, *42*, 501–510. doi:10.1016/j.molimm.2004.07.034

Thomas, P. D., Goodwin, J. M., & Goodwin, J. S. (1985). Effect of social support on stress-related changes in cholesterol level, uric acid level, and immune function in an elderly sample. *American Journal of Psychiatry*, *142*, 735–737. doi:10.1176/ajp.142.6.735

Tunnacliffe, A. (1998). CD3. In P. J. Delves (Ed.), *Encyclopedia of immunology* (2nd ed., pp. 465–468). Oxford, England: Academic Press.

Turner-Cobb, J. M., Koopman, C., Rabinowitz, J. D., Terr, A. I., Sephton, S. E., & Spiegel, D. (2004). The interaction of social network size and stressful life events predict delayed-type hypersensitivity among women with metastatic breast cancer. *International Journal of Psychophysiology*, *54*, 241–249. doi:10.1016/j.ijpsycho.2004.05.010

Uchino, B. N. (2004). *Social support and physical health: Understanding the health consequences of relationships*. New Haven, CT: Yale University Press.

Uchino, B. N., Cacioppo, J. T., & Kiecolt-Glaser, J. K. (1996). The relationship between social support and physiological processes: A review with emphasis on underlying mechanisms and implications for health. *Psychological Bulletin*, *119*, 488–531. doi:10.1037/0033-2909.119.3.488

Underdown, B. J. (1998). IgA. In P. J. Delves (Ed.), *Encyclopedia of immunology* (2nd ed., pp. 1196–1199). Oxford, England: Academic Press.

Weber, G. F., & Cantor, H. (1998). CD8. In P. J. Delves (Ed.), *Encyclopedia of immunology* (2nd ed., pp. 475–478). Oxford, England: Academic Press.

Whiteside, T., & Herberman, R. (1995). The role of natural killer cells in immune surveillance of cancer. *Current Opinion in Immunology*, *7*, 704–710. doi:10.1016/0952-7915(95)80080-8

Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment*, *52*, 30–41. doi:10.1207/s15327752jpa5201_2

Zorrilla, E. P., Luborsky, L., McKay, J. R., Rosenthal, R., Houldin, A., Tax, A., Schmidt, K. (2001). The relationship of depression and stressors to immunological assay: A meta-analytic review. *Brain, Behavior, and Immunity*, *15*, 199–226. doi:10.1006/brbi.2000.0597