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Affectionate Communication Can Suppress Immunity: Trait Affection Predicts Antibodies to Latent Epstein-Barr Virus

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The communication of affection in close relationships has been linked empirically to multiple physical and mental health benefits that are attributable largely to its stress-alleviating effects. Because affectionate communication frequently involves tactile contact of an intimate nature, however, it may also elevate vulnerability to opportunistic illness and infection, increasing the chances for immune system suppression. Using a sample of 52 healthy adults in cohabiting romantic relationships who were seropositive for latent human herpesvirus-4 (also known as the Epstein-Barr virus), the present study documented that self-reported trait expressed affection predicts antibody titers to Epstein-Barr virus viral capsid antigen complex, indicating viral replication and suppressed cell-mediated immunity.

Regarding the intersection of health and interpersonal communication, much attention has focused in recent years on the physical and mental health effects associated with communicating affection (e.g., Light, Grewen, & Amico, 2005). In close relationships, affectionate communication has been shown to have a stress-ameliorating effect, buffering individuals against the health problems related to stress and accelerating their physical recovery from elevated stress (see Floyd & Deiss, 2012). Data from a wide variety of experimental and correlational studies would appear unequivocally to support the claim that affectionate communication is good for one's health.

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Human communication is a complex enterprise, however, and such unequivocal claims are rarely defensible empirically. Such is the case with affectionate communication, which—given its frequent inclusion of intimate tactile contact such as kissing—has the potential to elevate transmission risks for opportunistic illness and infection. Indeed, such risks have led many public school districts to ban kissing among students on school grounds, largely in an effort to reduce the spread of infectious mononucleosis (Schmerling, 2010).

Whereas individuals who frequently express affection may therefore enjoy certain health advantages over their less-affectionate counterparts, they may also expose themselves to certain health risks. The present study considers the probability that highly affectionate communicators have comparatively elevated levels of antibodies against latent Epstein-Barr virus, an outcome that provides one measure of the strength of the immune system. Following is a brief overview of research on the health benefits and risks of affectionate communication, the particulars of the Epstein-Barr virus, and the study's prediction.

Health Benefits of Affectionate Communication

Researchers have long noted that many forms of physical affection behavior in personal relationships reduce signs of distress. De Chateau and Wiberg (1977) reported, for instance, that when mothers spent more time kissing their infants at suckling, the infants smiled more and cried less frequently. Affection exchange theory (Floyd, 2002, 2006a) explains that expressing affection in close relationships initiates neuroendocrine processes that maximize reward and buffer the individual against the physiological effects of stressors, and that such benefits are independent of those associated with receiving affectionate expressions. A number of studies have illustrated that pattern. For example, Floyd (2006b) examined the effects of affection on 24-hour variations in the steroid hormone cortisol. Cortisol normally follows a strong diurnal (i.e., 24-hour) rhythm wherein it peaks immediately after awakening and drops continually during the day, reaching its lowest point around midnight. A high degree of diurnal variation in cortisol levels reflects healthy regulation of the hypothalamic-pituitary-adrenal axis, one of the body's primary mechanisms for responding to acute stress. Contrariwise, "flattened" diurnal curves, reflecting little change in cortisol values from morning to evening, are indicative of chronic stress (Giese, Sephton, Abercrombie, Duran, & Spiegel, 2004; Heim, Ehlert, & Hellhammer, 2000). As hypothesized, Floyd (2006b) found that, with the effect of received affection controlled for, expressed affection was directly related to the magnitude of morning-to-evening change in cortisol ($\beta = .56$).

In a later experiment, Floyd, Mikkelsen, Tafoya, et al. (2007) found that during episodes of acute stress (in which cortisol levels are usually elevated), expressing affection in writing to a loved one accelerates the return of cortisol to normal levels. Grewen, Girdler, Amico, and Light (2005) similarly found that nonverbal affectionate interaction reduced cortisol levels for both men and women and also elevated levels of the "feel-good" hormone oxytocin in women (see also Turner, Altemus, Enos, Cooper, & McGuinness, 1999), whereas Floyd, Hesse, and Haynes (2007) found a strong negative relationship ($\beta = -.85$) between expressed affection and glycohemoglobin (an index of

average blood glucose level, which is elevated by stress), after controlling for the effects of received affection. In two experiments, Floyd, Mikkelson, Hesse, and Pauley (2007) also demonstrated that an affectionate writing exercise reduced total serum cholesterol (which is likewise elevated by stress) in a group of otherwise healthy adults.

The associations between health and affectionate behavior are not limited to physical well-being but extend to mental health as well. Using a comparison-groups method, Floyd (2002) showed that highly affectionate adults report greater overall mental health, less stress, lower susceptibility to depression, and higher satisfaction with their romantic relationships than do their less-affectionate counterparts. Due to the strongly reciprocal nature of expressed and received affection, one could conceivably argue that the mental and relational benefits associated with expressing affection are simply those associated with the amount of affection received in return. Affection exchange theory predicts, however, that communicating affection is beneficial on its own (i.e., its benefits are orthogonal to those of received affection), and four studies by Floyd et al. (2005) demonstrated that expressed affection accounts for significant variance in mental health, stress, depression, and relationship satisfaction even when received affection is controlled for.

Health Risks of Affectionate Communication

Comparatively less empirical attention has been paid to the health risks of affectionate communication, yet the extant results are noteworthy. Most such research has focused on risks associated with kissing, so the present review focuses on that work and excludes the variety of well-documented health risks associated with sexual interaction and sexual intercourse. (We acknowledge, of course, that kissing is often a behavioral component of sexual interaction, although kissing—as a form of affectionate nonverbal communication—can and does occur in the absence of sexual behavior.)

Kissing is unique in its health implications among nonverbal forms of affectionate behavior due to the implications of salivary exchange and potential blood exchange (via trace amounts of blood in the saliva). Physicians have warned for a century about the spread of infectious disease through kissing; Schamberg (1911) documented what he called an “epidemic” of syphilis transmission facilitated by nonsexual adolescent kissing.

Contemporary research continues to document health effects associated with kissing. Those effects include facilitating the transmission of viral infections, such as influenza (Schoch-Spana, 2000), herpes simplex viruses (Cowan et al., 2002), and infectious mononucleosis (Carbary, 1975). Similarly, a matched cohort study found that kissing quadrupled the risk of contracting meningococcal meningitis for adolescents 15 to 19 years of age (Tully et al., 2006). Romantic kissing can also facilitate transmission of drug allergies (Liccardi, Gilder, D’Amato, & D’Amato, 2002; Mancuso & Berdondini, 2006) and food allergies (Maloney, Chapman, & Sicherer, 2006) from one partner to the other. Health scientists have even warned of the potential for avian flu or HIV transmission from romantic kissing if microlesions are present on the oral mucosa of the infected partner (Maged, 2006; Piazza et al., 1989).

Those facts challenge the simplistic prediction that affectionate behavior is consistently associated with improved health outcomes. Because kissing is such a ubiquitous form of

nonverbal affectionate communication, affectionate behavior has the potential to increase health risks via the transmission of opportunistic illness or infection. The focus of the present study is on the immunosuppressing Epstein-Barr virus, detailed subsequently.

Epstein-Barr Virus and Immunosuppression

The Epstein-Barr virus (EBV) is a human herpesvirus that infects 80%–90% of adults by the age of 40 (Jones & Straus, 1987). Perhaps best known as the cause of infectious mononucleosis (see Ödegaard, 1967), EBV is also associated with a range of autoimmune diseases—including rheumatoid arthritis, systemic lupus erythematosus, Sjögren’s syndrome, and multiple sclerosis—as well as several cancers, including Hodgkin’s lymphoma and nasopharyngeal carcinoma (Maeda et al., 2009).

EBV is transmitted through salivary contact. Once infected, individuals harbor the virus for life (Tao, Young, Woodman, & Murray, 2006). Adequate cell-mediated immune function is required to maintain the virus in a dormant state, wherein the individual remains asymptomatic. Suppression of the immune system—*immunosuppression*—allows EBV to become active and to begin releasing viral antigens into the bloodstream. The adaptive immune system responds to the antigens by releasing antibodies (Glaser et al., 1991). Consequently, levels of antibodies against EBV antigens—the measure of which is known as EBV antibody titers—reflect the strength of an individual’s cell-mediated immune function.

Immunosuppression can result from a host of cognitive, emotional, and interpersonal stressors, including the stressors of academic exams (Glaser et al., 1993), caregiving responsibilities (Kiecolt-Glaser, Glaser, et al., 1987), loneliness (Glaser, Kiecolt-Glaser, Speicher, & Holliday, 1985), anxiety (Esterling, Antoni, Kumar, & Schneiderman, 1993), and involvement in a poor quality marriage (Kiecolt-Glaser, Fisher, et al., 1987). Several investigations have shown that affectionate communication has an inhibitory effect on stress that, considered alone, would suggest that affectionate communication is associated with lower antibody titers to EBV (see Floyd & Afifi, 2012).

Such a prediction, however, ignores the reality that affectionate interpersonal contact frequently includes salivary exchange via kissing, exposing people to the probability of contracting EBV when interacting with a seropositive other. Although speculations vary as to its origins, kissing is nearly ubiquitous across human cultures as a nonverbal means of communicating affection (Eibl-Eibesfeldt, 1970). Understandably, kissing behavior is included in psychometric indices for relational closeness (Berscheid, Snyder, & Omoto, 1989), intimacy (Waring, 1984), and affection (Floyd & Morman, 1998), which suggests consensus among social scientists that kissing is a pervasive affectionate behavior.

We therefore advance the prediction that people who are highly affectionate—and thus, more likely than average to kiss others—are in fact at *elevated* risk of harboring EBV and experiencing associated immunosuppression, relative to people who are typically less affectionate. If true, this finding would shed important light on the health risks of affectionate communication. Our specific hypothesis was as follows:

H₁: Affectionate communication predicts higher antibody titers to latent Epstein-Barr virus.

Method

Participants

Participants ($N=52$) were equal numbers of healthy male and female adults who were seropositive for latent EBV. Ages ranged from 19 to 67 years, with an average of 28.63 years ($SD=8.36$). Most of the participants (78.4%) were Caucasian, whereas 11.8% were Asian/Pacific Islander, 7.8% were Hispanic, 2.0% were African American, 2.0% were Native American, and 3.9% were of other ethnic origins (these percentages sum to >100 because participants were allowed to indicate more than one ethnicity). At the time of the study, 17.6% had completed some college but had no degree, 2.0% had completed an associate (2-year) degree, 29.4% had completed a baccalaureate (4-year) degree, 49.0% had completed a master's degree, and 2.0% had completed a professional doctorate (e.g., MD, JD).

Procedures

This study was part of a federally registered Phase I clinical trial (registry #1001 R03 MH075757-01A1) and was approved by the university's bioscience institutional review board. Some aspects of the procedures replicate those reported in Floyd et al. (2009).

Prescreening procedures

Participants were recruited from among the staff, undergraduate student, and graduate student populations at a large American university. The study was advertised in three ways: (a) via an electronic advertisement on the university's online campus newspaper; (b) via flyers posted on bulletin boards around campus; and, (c) via an electronic announcement sent to various university listservs. In all cases, prospective participants were directed to an online prescreening measure to determine their eligibility for the study. To be considered eligible, prospective participants had (a) to be 18 years of age or older, (b) to be able to speak and read English, (c) to be living full-time with a spouse or romantic partner, (d) to weigh at least 110 pounds, (e) to report no history of diagnosis or treatment for high cholesterol, (f) to report no current use of blood-thinning agents such as Coumadin, (g) to report no history of Type 1 or Type 2 diabetes, (h) to report that they were not currently pregnant or breastfeeding, and (i) to report no more than mild anxiety about having a capillary blood draw. A total of 188 prospective participants filled out and submitted the online prescreening questionnaire; of that number, 127 (67.6%) met all of the qualifications. Women and men were equally likely to be qualified for the study ($p>.05$). The most common reasons for disqualification were lack of current cohabitation with a romantic partner (a requirement for the clinical trial, reported elsewhere) and body weight of less than 110 pounds.

Laboratory procedures

Qualified participants who consented to take part in the study made an appointment to visit the Communication Sciences Laboratory and were sent a link to a longer online questionnaire to fill out beforehand. Participants were instructed to be fasting when they reported to the lab, having had nothing to eat or drink besides water for at

least 8 hours. Due to the fasting requirement, all lab sessions were scheduled between 7 am and 10 am.

When they reported for their laboratory visit, participants completed informed-consent forms. A researcher activated a Heat Factory (Vista, CA) brand single-use 50°C hand warmer and asked the participant to hold it in his or her nondominant hand while the participant's height and weight were recorded for the calculation of body mass index (BMI). The purpose of the hand warmer was to stimulate blood flow prior to the capillary puncture. Next, the researcher retrieved the hand warmer and used a 70% isopropyl alcohol swab to cleanse the third-digit fingertip of the participant's nondominant hand. Using a 1.75-mm Tenderlett surgical blade lancet (International Technidyne Corp., Edison, NJ), the researcher punctured the capillary bed and wiped away the first secretion of blood with a sterile gauze pad (see McCall & Tankersley, 2003). The researcher aspirated 40 µl of capillary blood into a heparinized glass tube, then spotted the blood onto standardized filter paper (Schleicher and Schuell #903, Keane, NH). Each filter paper was labeled with a study-generated ID number unique to the participant. Spotted filter papers were allowed to air-dry overnight and were then packaged in plastic bags with a desiccant pouch and kept refrigerated until they were shipped by overnight delivery to a separate laboratory for assay. The use of a 40 µl capillary tube for creating the blood spots ensured consistency in blood volume, which is essential for the reliability of the assays. After the capillary blood draw, the participant was offered juice and a cookie, was paid \$15, and was dismissed.

Measures

Trait expressed affection was measured with the 10-item Trait Affection Scale-Given (TAS-G; Floyd, 2002). TAS-G asks participants to assess how demonstrative they generally are of their affection for others by indicating their level of agreement with statements such as "Anyone who knows me would say I'm pretty affectionate" and "I am always telling my loved ones how much I love them" ($\alpha = .96$). This measure has been extensively validated (for discussion, see Floyd, 2006a).

Immunoglobulin G (IgG) antibodies against Epstein-Barr virus viral capsid antigen (EBV-VCA) complex were assessed in ELISA units at the Laboratory for Human Biology Research at Northwestern University according to procedures described in McDade et al. (2000). Upon arrival at the laboratory, the filter papers containing the dried blood spots were stored at -23°C . One day prior to the assays, the filter papers were removed from the freezer. A 2.5-mm diameter disk was punched from each blood spot and transferred with tweezers to a 12×75 glass tube, where 250 µl of diluent buffer was added. Each sample was incubated overnight at room temperature. On the day of the assays, 100 µl of the blood spot eluate was pipetted directly into microtiter wells (in duplicate), along with 100 µl of each standard and diluted control sera. The assay kits were an adaptation of a commercially available kit for measuring IgG antibodies for EBV-VCA in serum (DiaSorin Corporation, Stillwater, MN). The assay assesses antibodies against one viral capsid antigen protein, the p18 polypeptide. Antigen-antibody complexes form between the synthetic p18 peptide bound to the surface of the microtiter wells and the IgG antibodies present in the sample. Horseradish peroxidase-labeled

antihuman IgG reacts with the antigen-antibody complex. The concentration of the IgG antibody is directly related to the absorbance of the solution measured at 450 nm. Blood spot and plasma values for EBV antibodies are strongly linearly related, $r = .97$.

C-reactive protein (CRP), assayed in mg/L as a control measure against current or recent infection, was measured in the same laboratory according to procedures described in McDade, Burhop, and Dohnal (2004). As McDade et al. articulated, microtiter plates (Nunc MaxiSorp, Rochester, NY) were coated overnight with 100 μ L/well rabbit antihuman CRP antibody (Dako, Glostrup, Denmark) at a concentration of 10 mg/L in coating buffer. One 3.2-mm disk from each dried blood spot, control, and calibrator was eluted overnight at 4°C in 250 μ L of wash/elution buffer and rotated on a microplate shaker (3 mm orbit; Cole-Parmer, Vernon Hills, IL) at 300 rpm at room temperature for 60 minutes the following day. Eluate (100 μ L) from each disk was pipetted in duplicate into microtiter wells that had been blocked by incubation for 30 minutes with wash/elution buffer. Wells were washed after 2-hour incubation at room temperature with rotation at 250 rpm. Detection antibody (peroxidase-conjugated rabbit antihuman CRP antibody; Dako) was diluted to 0.163 mg/L in wash/elution buffer, added to the wells (100 μ L) and incubated for 2 hours at room temperature. The wells were washed, and 100 μ L of chromogenic substrate, 5 μ L of 300 g/L H₂O₂, and 12 mL of deionized H₂O were added for color development. Wells were incubated in the dark for 30 minutes before 100 μ L of stop solution (0.5 mol/L H₂SO₄) was added. The absorbance was read at 490 nm (BioTek Elx808), and sample concentrations were calculated from the best-fit four-parameter logistic calibration curve (KCJunior; BioTek). Samples reading above the highest calibrator were reanalyzed at a higher dilution factor. Within-assay coefficients of variation all indicated high reliability.

Results

Control for Current or Recent Infection

As recommended by McDade (personal communication, 2008), we measured CRP—an acute-phase protein that increases in the bloodstream in response to systemic inflammation—in order that we could eliminate from the sample any participants with active or recent inflammation or infection. CRP levels ranged from 0.086 to 7.16 mg/L ($M = 1.12$ mg/L, $SD = 1.46$). No participant had a CRP level equaling or exceeding the American Heart Association/Center for Disease Control Joint Scientific Statement criterion of 10 mg/L (Pearson et al., 2003); thus, all 52 participants were retained and screened for seropositivity.

Serostatus Determination

According to McDade et al. (2000), a value of < 18 ELISA units indicates nondetectable levels of EBV antibodies when the test is performed on blood spots. Individuals with such values are considered to be seronegative for EBV. Based on McDade et al.'s analyses, a criterion of ≥ 18 ELISA units was applied to determine seropositivity. Consistent with the ubiquity of EBV in the adult population, all participants in the study were

determined to be seropositive. Antibody scores ranged from 18.44 to 296.29 ELISA units ($M=116.35$, $SD=79.78$).

Descriptive Analyses

Scores for expressed affection and EBV antibodies were compared to participants' demographic characteristics for descriptive purposes. Women ($M=125.84$, $SD=88.09$) and men ($M=106.86$, $SD=70.98$) did not differ significantly on EBV antibody values, $t < 1$. In line with previous research, however, women reported significantly higher scores for expressed affection ($M=5.38$, $SD=1.38$) than did men ($M=4.52$, $SD=1.41$), $t(49)=-2.22$, $p=.031$ (two-tailed). Neither variable was significantly correlated with participants' age or BMI and neither variable differed significantly between ethnic groups (all $ps > .05$).

Hypothesis

The hypothesis was that expressed affection predicts the level of EBV antibody titers. Because the measurement of affection preceded the blood spot tests for EBV and because EBV antibody values did not vary systematically by sex, age, BMI, or ethnicity (necessitating the use of hierarchical regression), the hypothesis was tested with a one-tailed correlation. Distributions for measures of physiological outcomes are often skewed; in this study, the distribution for EBV antibody scores was highly negatively skewed. As a result, Spearman's Rho was used instead of Pearson Product-Moment Correlation, as the former is more appropriate when one or both variables exhibit significant skewness (Siegel, 1956). Consistent with the hypothesis, expressed affection significantly predicted EBV antibody scores, $\rho(49)=.24$, $p < .05$.

Discussion

Despite its well-documented stress-ameliorating health benefits, affectionate communication in personal relationships has the potential to elevate the risk of opportunistic illness and infection, largely because of salivary and trace blood transfer associated with kissing. We therefore predicted that adults who were seropositive for latent EBV (and who were not suffering from current or recent systemic inflammation or infection) would evidence greater numbers of EBV antibodies if they reported being highly affectionate than less affectionate. A significant nonparametric correlation, with a moderate effect size, confirmed our prediction.

This finding, although focused on only one health outcome, further illuminates the risk associated with intimate communication. For scholars of health communication and interpersonal communication alike, it is beneficial to note that close relationships can be a dual-edged sword when it comes to well-being. Although they can and do promote healthy behaviors and buffer the effects of stress, they also expose participants to opportunistic illness. That reality is widely acknowledged for health outcomes such as HIV and other sexually transmitted diseases; the present finding offers reason to believe it may also be relevant to close social (yet nonsexual) relationships.

Although the study design was correlational, it benefited from the use of an objectively measured health marker, EBV antibody titers. Whereas self-assessments of well-being or even self-reports of specific symptoms can be useful as suggestions of underlying physiological processes and conditions, direct assessment is not bound by social desirability or memory biases that can make the former methods unreliable. An additional benefit is that the health measure we chose to study, EBV, is implicated in a range of disorders, as detailed above.

Limitations and Extensions

Due to the prescreening process and the enforcement of multiple inclusion and exclusion criteria, the sample was probably healthier than a comparably sized sample drawn at random from the same population. The extent to which the observed association between affectionate communication and EBV antibodies would replicate in a different sample is unknown, but replication of the finding would certainly be a worthy goal for future work. The sample was also small relative to those typically seen in mainstream health communication and interpersonal communication research. It was, however, within the norm for psychophysiological studies (e.g., Kurup & Kurup, 2003; Marazziti & Canale, 2004; van Niekerk, Huppert, & Herbert, 2001), including those conducted within the communication discipline (e.g., Tardy, Thompson, & Allen, 1989). The controlled nature of the trial, the relative inability of participants to introduce error variance (at least, in their hematological outcome) via social desirability or memory biases, and the emergence of a significant hypothesized effect all argue for the adequacy of the sample size.

Because we used a global trait measure of affectionate behavior, we cannot say with certainty whether kissing is to blame for the connection with elevated EBV antibodies, although that makes the most sense given that EBV is transmitted through salivary contact. A single item elsewhere in our questionnaire asked participants to report on a 7-point scale how often they kissed their most affectionate partner on the lips. Although focused on behavior in only one relationship—as opposed to a behavioral trait—that score was strongly correlated with the score on our global affection measure, $r(51) = .58, p$ (two-tailed) $< .001$. That suggests that people who are generally affectionate as a global communication trait also tend to kiss their most affectionate partners on the lips quite frequently. The single-item relationship-specific kissing measure was not significantly associated with EBV antibody titers, however, $\rho(49) = .05, p > .05$, suggesting the possibility that kissing (or related affectionate behaviors) in other relationships are more culpable. Obviously that is an empirical question and one that must be deferred to later studies.

In addition to replicating the observed association, future research could extend the present findings by examining the causal link (if any) between affectionate behavior and EBV antibody levels. If expressing affection—and kissing, in particular—increases the risk for opportunistic illness or infection, then experimentally increasing affectionate behavior should cause EBV antibody levels to rise over time relative to a control group. That finding could fuel efforts on the part of health communication researchers to teach people, especially adolescents, more about the risks of intimate interaction.

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