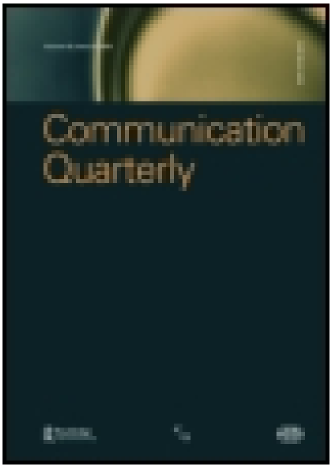

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Kory Floyd , Colin Hesse & Mark T. Haynes
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Human Affection Exchange: XV. Metabolic and Cardiovascular Correlates of Trait Expressed Affection

Kory Floyd, Colin Hesse, & Mark T. Haynes

Recent research on the communication of affection has begun to illuminate its implications for mental and physical health. Specifically, when compared to non-affectionate people, self-report studies have indicated that highly affectionate people are less susceptible to depression and stress, and endocrine studies have shown that highly affectionate people have more differentiated 24-hour cortisol rhythms (a pattern indicative of adaptive physiological stress management). The present studies extend this knowledge by focusing on the associations that trait affection has with cardiologic (resting heart rate), vascular (resting blood pressure), and metabolic (glycosylated hemoglobin) properties of physical health. Participants in both studies provided self-assessments of their trait levels of expressed affection and received affection (the latter for use as a covariate). Resting heart rate and blood pressure were assessed in the first study, and glycosylated hemoglobin was assessed in the second study. Results indicate that when the influence of received affection is controlled for, trait expressed affection was inversely related to resting blood pressure and glycosylated hemoglobin (but not heart rate), suggesting that the expression of affection is associated with a healthy vascular and metabolic profile.

Keywords: Affection; Affection Exchange Theory; Blood Glucose; Blood Pressure

Kory Floyd (PhD, University of Arizona, 1998) is an associate professor of human communication at Arizona State University, where Colin Hesse (BA, Whitworth College, 2003) is an MA student and Mark Haynes (MS, Illinois State University, 2000) was a doctoral student. The authors are grateful for the technical advice of Jason Short, MD, and Anne Vogel, RN. *Correspondence*: Kory Floyd, Hugh Downs School of Human Communication, Arizona State University, P.O. Box 871205, Tempe AZ 85287-1205; Tel.: (480) 965-3568; E-mail: kory@asu.edu

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The motivation to be loved is so powerful a part of the human experience that many have come to consider it a fundamental human need (Baumeister & Leary, 1995; Maslow, 1970). Perhaps unsurprisingly, a robust body of research describes the mental and physical health benefits of receiving expressions of love and appreciation in the form of affectionate communication. Affectionate communication consists of the verbal and nonverbal behaviors through which humans convey feelings of love, fondness, and positive regard for others, and it serves many important functions with respect to the initiation and maintenance of personal relationships (for review, see Floyd, 2006a). Moreover, it appears to enhance the health and well-being of those who receive affectionate expressions. For instance, in a multi-wave longitudinal study, Schwartz and Russek (1998) found that expressions of love and caring made to college students by their parents inversely predicted the students' physical and psychological distress as many as 42 years later. Moreover, Komisaruk and Whipple (1998) found that those who receive fewer expressions of love than they desire to be more susceptible to psychosomatic illness, and Shuntich, Loh, and Katz (1998) found that affection is inversely related to alcohol abuse and physical aggression toward family members.

Although the benefits of *receiving* affection have been well established, recent research on communication and psychophysiology has begun to elucidate the health correlates of *expressing* affection. Multiple studies reported by Floyd (2002) and Floyd, Hess, Miczo, Halone, Mikkelson, and Tusing (2005) have established that highly affectionate individuals are advantaged, relative to their less-affectionate counterparts, in terms of their mental health, life satisfaction, and susceptibility to depression and stress. Importantly, although these associations can partially be accounted for by the higher amounts of affection that highly affectionate communicators elicit from others, Floyd & Mikkelson (2005) demonstrated that expressed affection accounts for a significant variance in these mental and physical health measures even after the effects of received affection are controlled.

Expressed affection has been shown to covary with physiological health parameters as well. On the basis of communication and health psychology theory, Floyd (2006b) hypothesized that being highly affectionate (as a trait) would be adaptive with respect to the management of stress. As one means of addressing this hypothesis, Floyd examined the effects of expressed and received affection on 24-hour variation in healthy adults' levels of the steroid hormone cortisol. Low levels of 24-hour variation are indicative of chronic stress (Chrousos & Gold, 1992; Heim, Ehlert, & Hellhammer, 2000). Floyd (2006b) thus predicted that expressed affection is directly related to the magnitude of morning-to-evening change in cortisol. As expected, Floyd found a strong linear relationship ($\beta = .56$) between expressed affection and diurnal cortisol variation, with the effect of received affection controlled for. A subsequent experiment by Floyd, Mikkelson, Tafoya, Farinelli, La Valley, Judd, Haynes, Davis, and Wilson (in press) demonstrated that during episodes of acute stress (in which cortisol levels are typically elevated), expressing affection to a loved one can accelerate the recovery of cortisol levels to baseline values, relative to alternative activities.

Considered collectively, these findings suggest that affectionate communication is reliably associated with benefits not only for personal relationships, but also for the individuals that comprise them. Whereas the self-report data reported in Floyd (2002) and Floyd et al. (2005) are noteworthy, the physiological data reported in Floyd (2006b) and Floyd et al. (in press) are more provocative in their demonstration that affectionate behavior covaries with physical, not simply self-reported, properties of health. Indeed, these data have the potential to contribute to the development of behavioral (non-pharmacological) interventions that may aid in the management of stress and its multiple related disorders (see, e.g., Blascovich, Shiffert, & Katkin, 1989; Kiecolt-Glaser, Glaser, Shuttleworth, Dyer, Ogrocki, & Speicher, 1987).

An important shortcoming of the Floyd (2006b) and Floyd et al. (in press) findings, however, is that they are limited to endocrine system behavior. Although hormones such as cortisol are intimately involved in the physiological stress response, the effects of stress are also manifested in cardiologic, vascular, and metabolic activities, each of which has implications for overall health. The two studies presented herein are designed to expand knowledge on the physiological correlates of affectionate behavior by examining associations between trait expressed affection, resting heart rate, resting blood pressure, and glycosylated hemoglobin (an assessment of average blood glucose over a period of 8–12 weeks). These studies are grounded in affection exchange theory, the relevant tenets of which are described subsequently. Descriptions of the health measures follow, along with formal explication of the two studies.

Affection Exchange Theory

Affection exchange theory (AET; Floyd, 2006a) conceives of affectionate communication as an adaptive behavior that contributes to humans' superordinate motivations for viability and fertility. AET assumes the Darwinian principle of selective fitness, whereby organisms that best adapt to the demands of their social and physical environments are the most likely to survive and procreate. The theory offers specific links between the expression of affection and human viability, providing that the communication of affection within an optimal range of expression activates physiological pathways that moderate the body's fight-or-flight system, fortifying its ability to defend itself against threats (whether genuine or perceived). One proposed result is that individuals who are highly expressive of affection manifest less-exaggerated physiological responses to stressors than do their less-affectionate counterparts. As we articulate in the next section, reactivity to stress engages multiple physiological systems; whereas earlier research tested AET's prediction with respect to hormonal activity, the current studies focus on predicted relationships between affectionate behavior and cardiovascular and metabolic activity. A more detailed description of stress and its predicted associations with affectionate communication is offered subsequently.

Affectionate Communication and Stress

AET proposes that expressing affection ameliorates the physical symptoms of stress by downregulating the body's fight-or-flight system, helping to prevent exaggerated cardiovascular, endocrine, and immune responses to stressors. A logical derivation is that the amount of affection people typically communicate to others is inversely related to physical stress parameters, independent of the amount of affection that people typically receive from others. Whereas Floyd's (2006b) test of this prediction focused on cortisol levels, we extend this research by examining three additional stress markers: resting blood pressure, resting heart rate, and glycosylated hemoglobin. Blood pressure and heart rate are explicated here, as these measures were tested in the first study. Glycosylated hemoglobin is described in the discussion section following study one, as is an additional hypothesis to be tested in the second study.

Blood Pressure

The assessment of blood pressure (BP) consists of two interrelated measures: *systolic BP*, which indexes the force exerted against the arterial walls when the heart is contracting (during beats); and *diastolic BP*, which assesses arterial force when the heart is resting (between beats). According to the most recent report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, healthy adults manifest resting systolic BP values of $\leq$120 and resting diastolic BP values of $\leq$80 (Chobanian et al., 2003). A robust body of research attests to the detrimental health effects of suboptimal BP. The World Health Organization (WHO) reports that hypertension accounts for 7.1 million deaths per year, making it the number one attributable risk for death worldwide. Research has long implicated stress as one of the principal risk factors for development of hypertension (e.g., Alexander, 1939; Davidson & Gidron, 1999; Jorgensen, Johnson, Kolodziej, & Shreer, 1996). To the extent that affectionate behavior covaries with lower levels of chronic stress (Floyd, 2002) and/or reductions in the effects of acute stress (Floyd et al., in press), it would likewise be expected to correlate inversely with resting BP. Some evidence already indicates that *receiving* affectionate behavior is related to a lower BP. In a study of 59 premenopausal women, Light, Grewen, and Amico (2005) found that the number of hugs women reported receiving from their male romantic partners was inversely associated with their resting systolic and diastolic blood pressures. Whether *expressing* affection is similarly cardioprotective remains to be seen, although AET provides one basis for predicting that it is. Consequently, we advanced the following hypothesis:

> *H1*: *With the influence of trait received affection controlled for, trait expressed affection manifests an inverse linear relationship with resting systolic and diastolic blood pressures.*

Heart Rate

Heart rate (HR) refers to the number of cardiac contractions within a given period of time, such as a minute. Healthy adults manifest resting heart rates of approximately 64–72 BPM for men and 72–80 BPM for women (Marieb, 2003). Resting HR is elevated by chronic stress (e.g., Buckley & Kaloupek, 2001), which is significant because lower resting heart rates are associated with reduced risk of coronary heart disease and cardiovascular mortality (Gillum, Makuc, & Feldman, 1991). No study to date has assessed whether expressing affection is associated with resting HR; however, to the extent that expressing affection results in amelioration of stress, as AET posits, it may very well effect such a reduction. This led to our second hypothesis:

> *H2*: *With the influence of trait received affection controlled for, trait expressed affection manifests an inverse linear relationship with resting heart rate.*

Finally, investigations of trait expressed and received affection have consistently reported that these are sexually dimorphic traits, with women scoring higher on both outcomes than men (for extensive review, see Floyd, 2006a). According to AET, such a difference may reflect both culturally reinforced gender role models, prompting women to be more affiliative than men, and also sex differences in the hormonal rewards elicited by affection exchange. To replicate these comparisons here, we offer a third hypothesis:

> *H3*: *Compared to men, women report higher levels of both trait expressed affection and trait received affection.*

Study One

Participants and Procedures

Participants ($N = 48$) were 16 male and 32 female undergraduate students at a large public university in the southwestern United States. They ranged in age from 18 to 37 years, with an average age of 21.04 years ($SD = 4.30$). No other demographic data were collected on the sample.

Participants were recruited for a "study of communication and health" from among undergraduate communication courses. Each student who agreed to take part made an appointment to visit the laboratory and was given a questionnaire to complete beforehand. At their appointed times, participants reported to the Communication Sciences Laboratory, where they turned in their completed questionnaires and filled out informed consent forms. Next, participants sat quietly for approximately 10 minutes to achieve a resting heart rate. A researcher (the lead author) then assessed each participant's heart rate and systolic and diastolic blood pressure, after which the participant was excused. Participants received extra course credit in exchange for their participation.

Measures

Trait expressed affection was assessed in the questionnaires with the TAS-G (Floyd, 2002), a ten-item self-report measure of the extent to which one is, by nature, an affectionate person (alpha = .90). To control for its potential moderating effects, we also measured *trait received affection* using the six-item TAS-R scale (Floyd, 2002), which assesses the extent to which people tended to receive affectionate expressions from other people (alpha = .84). Psychometric information for both scales appears in Floyd et al. (2005). *Resting systolic* and *diastolic blood pressures* were measured by the lead author in mmHg via the auscultatory method with a W. A. Baum aneroid sphygmomanometer, which uses a non-latex, V-Lok cuff. The first and fifth Korotkoff sounds were used as indications of systolic and diastolic arterial pressure, respectively. The Baum sphygmomanometer complies with the American National Standards Institute/Association for the Advancement of Medical Instrumentation (AAMI, 1987) SP-9 standards for accuracy (1% full scale $\pm$ 3 mm Hg). *Resting heart rate* was assessed in beats-per-minute, based on a 15-second manual wrist pulse count. The lead author was trained in HR and BP assessment by the senior clinical procedures instructor at the university's college of nursing.

Results

Descriptive statistics

Participants' average scores were above the median for both expressed affection ($M = 5.01$, $SD = 1.04$) and received affection ($M = 4.93$, $SD = .96$). Scores on HR ranged from 56 to 112 BPM, with a mean of 71.72 ($SD = 12.41$). For blood pressure, scores for systolic BP ranged from 80 to 154 mm Hg, with an average of 110.74 ($SD = 17.57$); scores for diastolic BP ranged from 40 to 99 mm Hg, with an average of 66.36 ($SD = 13.81$). Women and men differed significantly from each other on systolic BP, with men ($M = 116.94$, $SD = 12.92$) scoring higher than women ($M = 104.69$, $SD = 16.79$), $t\ (46) = 2.56$, $p = .014$ (two-tailed), partial $\eta^2 = .09$. Sex differences were nonsignificant for diastolic BP and HR ($p > .05$).

Hypotheses

The first hypothesis proposed that with the influence of received affection controlled for, expressed affection is inversely associated with resting BP. To test the prediction, we entered systolic and diastolic blood pressures as criterion variables in separate

Table 1 Hierarchical Regression Predicting Systolic Blood Pressure (N = 48)

Predictors	Zero-order r	B	SE B	β	ΔR^2
Step 1					.32†
Age	.06	.49	.50	.13	
Sex	−.35*	−10.60	4.38	−.31*	
Received affection	−.45†	−7.80	2.23	−.45†	
Step 2					.13†
Expressed affection	−.61†	−8.66	2.80	−.55†	

Multicollinearity diagnostics were unremarkable. $R^2 = .44$; adjusted $R^2 = .39$; $F\ (4,\ 47) = 8.46$, $p < .001$, $^*p < .05$, $^\dagger p < .01$.

Table 2 Hierarchical Regression Predicting Diastolic Blood Pressure (N = 48)

Predictors	Zero-order r	B	SE B	β	ΔR^2
Step 1					.21*
Age	−.01	.27	.43	.09	
Sex	−.13	−2.36	3.82	−.08	
Received affection	−.44†	−6.40	1.95	−.45†	
Step 2					.10*
Expressed affection	−.54†	−6.17	2.53	−.48*	

Multicollinearity diagnostics were unremarkable. $R^2 = .31$; adjusted $R^2 = .24$; F (4, 47) = 4.75, $p = .003$, $^*p < .05$, $^\dagger p < .01$.

hierarchical linear regressions. The first block of each regression contained received affection, along with participant sex (coded as 1 = male, 2 = female) and participant age as control variables. Expressed affection was entered in the second block.

The regression analysis for systolic BP was significant, $R^2 = .44$, adjusted $R^2 = .39$, F (4, 43) = 8.46, $p < .001$. Full regression results appear in Table 1. The regression analysis for diastolic BP was likewise significant, $R^2 = .31$, adjusted $R^2 = .24$, F (4, 43) = 4.75, $p = .003$. Full regression results appear in Table 2. The results for both regressions reveal that with the effects of received affection controlled, expressed affection is inversely related to resting systolic BP ($\beta = -.55$) and resting diastolic BP ($\beta = -.48$). The first hypothesis is supported.

The second hypothesis proposed that, with the effects of received affection controlled, expressed affection is inversely related to resting heart rate. We entered heart rate as the criterion variable in a hierarchical regression, with received affection, sex, and age in the first block and expressed affection in the second block. The regression analysis was significant, $R^2 = .23$, adjusted $R^2 = .16$, F (4, 43) = 3.17, $p = .023$. However, the addition of the second block produced a nonsignificant change in R^2 ($p > .05$), indicating no effect of expressed affection on resting heart rate ($\beta = -.19$, $p = .36$). The second hypothesis is not supported.

The third hypothesis offered that women report higher levels of expressed and received affection than do men. Women's average scores for expressed affection ($M = 5.16$, $SD = .99$) exceeded those of men ($M = 4.71$, $SD = 1.10$); however, the difference was not statistically significant. Likewise, women scored higher on received affection ($M = 4.99$, $SD = .84$) than did men ($M = 4.84$, $SD = 1.18$), but this difference was also nonsignificant. The third hypothesis is not supported.

Discussion

The primary aim of this study was to investigate relationships between trait expressed affection and resting BP and HR while holding the influence of received affection constant. As predicted, expressed affection was inversely associated with resting systolic and diastolic blood pressures. The association with heart rate, although inverse, was nonsignificant. These findings demonstrate that the health correlates of expressed affection reside not only in the endocrine system (as identified by Floyd, 2006b) but are also appreciable in the vascular system. The connection to blood pressure is informative, given the numerous and substantial physical problems associated with hypertension (World Health Report, 2002). Obviously these correlational data do not indicate that increasing affectionate behavior would effect a reduction in blood pressure, although theories such as the tend and befriend theory (Taylor, Klein, Lewis, Gruenewald, Gurung, & Updegraff, 2000) provide a basis for hypothesizing such a causal relationship. We are uncertain as to why the predicted association with resting heart rate failed to manifest, although a relative lack of variance (compared to blood pressure) may partially explain the nonsignificant correlation. Moreover, heart rate may be less stable than blood pressure, necessitating the use of a multiple-measurement strategy wherein several equally spaced measures of HR are aggregated to arrive at the resting HR value. It may also be the case that whatever variance in HR that can be theoretically attributed to expressed affection is simply too small, relative to factors such as metabolic demand, to be appreciable. These and other possibilities will await further investigation.

A secondary aim of the first study was to replicate earlier research identifying systematic sex differences in expressed and received affection. As Floyd (2006a) detailed, nearly every published comparison has indicated that women both give and receive more affection than do men, and those that have not have produced null results. Although the mean comparisons for expressed and received affection in this study were both in the hypothesized direction, the differences were nonsignificant in this sample. A small handful of other studies has similarly reported nonsignificant sex differences (e.g., Bombar & Littig, 1996), although this outcome is so rare (relative to the robust collection of studies that does report significant differences) as to be considered anomalous. Whereas it may be tempting to view these results as evidence of similarity between women and men, it must be recalled that null results are *non-findings* that do not warrant such a conclusion. Because we used the measures of received and expressed affection in both studies, we tested H3 again in study two.

The purpose of the second study was to extend the investigation of the health correlates of expressed affection further still, by examining an important metabolic parameter that has direct implications for stress, glycosylated hemoglobin, which is described subsequently.

Glycoslated hemoglobin (HbA_{1c})

Proteins, fats, and carbohydrates from food are converted on an ongoing basis to *glucose*, the principal source of energy for living cells. Glucose that is not burned for energy remains free in the bloodstream and is referred to as *blood glucose*. Some of these glucose molecules react with hemoglobin (Hb) to produce *glycosylated hemoglobin* (also referred to as HbA_{1c}), a component of Hb bound irreversibly to glucose. A single measure of glycosylated hemoglobin represents the average blood glucose level during the preceding 8 to 12 weeks. Healthy nondiabetic adults should manifest HbA_{1c} values of 2.2% to 4.8% (Pagana & Pagana, 2002, p. 258). Importantly, blood glucose level is affected by stress (Netterstrøm, Danborg, & Olesen, 1988). During periods of physical or emotional stress, epinephrine and cortisol increase blood glucose to fuel the body's fight-or-flight response. Because HbA_{1c} indexes aggregate blood glucose level and because blood glucose is elevated during stress, then it is logical to predict a direct linear association between stress and HbA_{1c} level. This led us to pose a fourth hypothesis, to be tested in the second study:

> *H4*: *With the influence of trait received affection controlled for, trait expressed affection manifests an inverse linear relationship with* HbA_{1c}.

Study Two

Participants and Procedures

Participants ($N = 30$) were equal numbers of male and female undergraduate students at a large public university in the southwestern United States. They ranged in age from 19 to 49 years, with an average age of 22.63 years ($SD = 5.31$). Most (90%) were single; 10% were married. Ten percent of the sample was Asian, 3.3% was African American, 16.7% was Hispanic, 66.7% was Caucasian, and 3.3% was of other ethnic origins.

Prospective participants received extra course credit in exchange for completing prescreening measures to determine their eligibility for the study. To be considered eligible for the laboratory study, prospective participants had to meet stringent inclusion criteria. Specifically, all participants were normotensive and non-smokers; reported never having had chemotherapy or chest radiation; reported no history of hepatitis, endocrine disease, kidney or liver disease, cancer, cardiovascular disease, rheumatological disorders, respiratory problems, sickle cell disease, thalassemia, or diabetes; and reported no current use of alpha-blockers, beta-blockers, or steroids. Additionally, all female participants were nulliparous, were not currently pregnant, and were not currently breastfeeding. Because the audience sampled consisted primarily of healthy young adults, a majority (72%) of those who completed the prescreening questionnaire met all of the qualification criteria. Women and men were equally likely to be qualified for the study ($p > .05$).

Eligible prospective participants were contacted via telephone or email and invited to take part in the study. Those who consented to participate made an appointment to complete the study and were sent a questionnaire to fill out beforehand. At their appointed times, participants reported to the Communication Sciences Laboratory, where they turned in their completed questionnaires and filled out informed consent forms. Next, a researcher (one of the three authors) recorded their height and weight for calculation of body-mass index (BMI), a potential covariate in the assessment of HbA_{1c}. The researcher then drew 10 μl of capillary blood from the third digit fingertip of each participant's nondominant hand for assessment of HbA_{1c}. After disinfecting the site with a 70% isopropyl alcohol swab, the technician used a

3.0 mm Stat-Let 21-gauge lancet on the fingertip to extract the blood (see McCall & Tankersley, 2003). If necessary to stimulate capillary blood flow, the researcher warmed the digit with a 130°F Thermo-Pad sodium acetate trihydrate hand warming pad. Blood was aspirated into a pipette and added to a diluent prior to analysis. All researchers had received university training in the avoidance of bloodborne pathogens and employed universal precautions while drawing and handling blood samples, including the use of lab coats and synthetic (non-latex) gloves. After each capillary blood draw, lancets, test materials, and gloves were discarded into biohazard containers. The puncture site was bandaged, and then participants were debriefed, thanked for their participation, and excused. Each participant was paid $5.

Measures

Trait expressed affection and *trait received affection* were again measured with the TAS-G and TAS-R scales, respectively. Coefficient alphas were .88 for expressed affection and .90 for received affection. The questionnaire also contained additional measures relevant to participants' health and their relationships that are not reported here. *Glycosylated hemoglobin* (HbA_{1c}) was assessed via the micro-optical detection method using a commercially available, CLIA-waived test manufactured by Metrika (Sunnyvale, California, USA). Capillary blood was first diluted with 0.69 mL of a buffered detergent solution with ferricyanide. Diluted blood samples were then transferred to the test instrument, which utilizes immunoassay and dry-reagent chemical analysis to determine percentage of HbA_{1c}, expressed as ($HbA_{1c}/Hb \times 100$). The Metrika test has been certified by the National Glycohemoglobin Standardization Program (NSGP) as having documented traceability to the Diabetes Control and Complications Trial (DCCT) Reference Method, which requires nonsignificant coefficients of variation (<5.0) and 95% confidence intervals of differences within $\pm 1\%$ of total glycosylated hemoglobin. In validity assessments, the Metrika reported high clinical accuracy compared to tests conducted using venous blood (average $r = .90$), and equivalent reliability when conducted by trained professionals and untrained patients (average $r = .93$).

Results

Descriptive statistics

Participants' average scores were above the median for both expressed affection ($M = 5.36$, $SD = .90$) and received affection ($M = 5.22$, $SD = 1.05$). Scores on HbA_{1c} ranged from 4.0% to 6.0%, with a mean of 5.28% ($SD = .46$). Women and men did not differ significantly from each other on HbA_{1c} ($p > .05$). Based on height and weight measurements, we calculated BMI for each participant, using the National Institutes of Health formula, to use as a potential covariate. Scores ranged from 16.8 to 34.0, with an average of 23.02 ($SD = 3.67$). This average score represents a "normal" (i.e., not underweight or overweight) BMI for adults, according to

Table 3 Hierarchical Regression Predicting Glycosylated Hemoglobin (N = 30)

Predictors	Zero-order r	B	SE B	β	ΔR^2
Step 1					.15
Age	.14	−.01	.19	−.01	
Sex	.23	.03	.02	.37	
BMI	.10	.01	.10	.02	
Received affection	−.19	−.04	.03	−.34	
Step 2					.28*
Expressed affection	−.20	−.43	.13	−.85*	

Multicollinearity diagnostics were unremarkable. $R^2 = .43$; adjusted $R^2 = .31$; F (5, 24) = 3.55, $p = .015$, $^*p = .002$.

Centers for Disease Control and Prevention (2006) standards. Women and men did not differ significantly from each other on BMI ($p > .05$).

Hypotheses

The fourth hypothesis predicted that with the influence of received affection controlled, expressed affection is significantly and inversely related to HbA_{1c}. We tested the prediction in a regression containing received affection, participant sex, participant age, and BMI in the first block. Expressed affection was entered in the second block. The regression analysis was significant, $R^2 = .43$, adjusted $R^2 = .31$, F (5, 24) = 3.55, $p = .015$. Full regression results appear in Table 3. As the results illustrate, with the effects of sex, age, BMI, and received affection controlled, expressed affection was significantly and inversely related to HbA_{1c} ($\beta = -.85$). The fourth hypothesis is supported.

We also re-tested the third hypothesis, which predicted that women report both giving and receiving more affectionate communication than men. As expected, women scored higher on expressed affection ($M = 5.71$, $SD = .86$) than did men ($M = 5.02$, $SD = .82$), t (28) = − 2.25, $p = .016$, partial $\eta^2 = .15$. Women likewise scored higher on received affection ($M = 5.62$, $SD = .99$) than did men ($M = 4.81$, $SD = .96$), t (28) = − 2.27, $p = .008$, partial $\eta^2 = .15$. The third hypothesis is supported.

Discussion

This study was designed to augment the results of study one by investigating the relationship between expressed affection and glycosylated hemoglobin, one indicator of healthy metabolic control. Working from the same theoretical basis that guided study one, we hypothesized that with the influence of received affection controlled for, expressed affection manifests an inverse relationship with HbA_{1c}, and the prediction was confirmed. This finding indicates that, irrespective of the influence of received affection, people who express more affection to others have significantly lower average blood glucose levels over the preceding 8–12 weeks than do their less affectionate counterparts.

As with blood pressure, this correlational finding does not indicate any causal relationship between affection and HbA_{1c}. Were such a relationship to be identified, however, it could be of pragmatic value as an ancillary, nonpharmacological intervention in the treatment of conditions such as Type I and Type II diabetes mellitus, for which proper regulation of blood glucose levels is essential. We believe that the demonstration of a strong association between expressed affection and HbA_{1c} warrants the investigation of a potential causal relationship, and research currently underway in our lab is testing for such a relationship.

Because we used the same measures of expressed and received affection in both studies, we re-tested H3, which predicted that women would score higher than men on both measures. Unlike study one, the prediction was confirmed in this sample. These results, as well as the large body of literature that has also reported these sex differences, make it even more likely that the null effects observed in study one represent statistical anomalies. Of course, the question of sex differences in received and expressed affection is not central to these studies' goals, which were to ascertain cardiovascular and metabolic correlates of expressed affection, so the variance in its outcomes is not largely consequential.

General Discussion

The present studies investigated physiological correlates of trait expressed affection, including blood pressure, heart rate, and HbA_{1c}. AET was applied to the question of whether more affectionate individuals would have lower blood pressure, heart rate, and blood glucose levels. AET proposes that affection is an adaptive behavior that downregulates the stress response, preventing exaggerated physiological reactivity to acute stress and improving the ability of the body to manage chronic stressors. In line with this prediction, we found that expressed affection was inversely related to two stress parameters, resting blood pressure and HbA_{1c}, and that these relationships were obtained even after controlling for the effects of received affection. Considered in conjunction with earlier research demonstrating that expressed affection is directly related to 24-hour cortisol variation (Floyd, 2006b), these findings (and the observation that resting heart rate was unaffected by expressed affection) add important specificity to AET's proposition regarding downregulation of the physiological stress response. Besides strengthening the theory's more general claim that affectionate behavior—including affection expressed to other people—is implicated in mental and physical well-being, these findings direct attention to important stress parameters that covary with expressed affection.

An important methodological feature of the present studies is their departure from the complete reliance on self-report measures that characterizes much interpersonal communication research (including much of the authors' own work). In research on affection, self-report measures have been extremely useful because, as Floyd and Mikkelson (2005) noted, affectionate behavior often occurs so sporadically and/or so privately that researchers may have difficulty measuring it any other way. Despite their utility, however, self-report measures (and even behavioral measures, unless unobtrusive) are prone to social desirability biases that are far less relevant to objective physiological measures, given participants' relative inability to manipulate physiological parameters for social desirability purposes. The use of such measures, therefore, affords greater confidence in the observed associations.

Although the present findings are correlational (and thus, do not confirm any type of causal relationship), identifying patterns of significant covariation is the first step in establishing a causal link. Given the nature and the magnitude of the associations observed in these studies, additional research to test for causal association is clearly warranted. If identified, such relationships could aid in the development of behavioral (nonpharmacological) interventions that could serve as ancillary treatments for relevant disorders, such as hypertension (for blood pressure) or diabetes mellitus (for HbA_{1c}).

Strengths, Limitations, and Conclusions

As mentioned previously, the present studies benefited from the use of objectively measured physiological indices, in addition to self-report measures. Whereas earlier research identified covariation between self-reported affection and self-reported health (e.g., Floyd, 2002), the present studies demonstrate that affectionate behavior also shares significant variance with physical dimensions of health. The association with blood glucose level was particularly noteworthy in its magnitude, emphasizing the notion that the trait of being highly affectionate corresponds to healthier metabolic control. These results provide a promising lead in further developing a full picture of the systematic relationship between communicative behavior tendencies and physiological profiles indicative of physical well-being.

An additional strength of the second study was the use of a sample that was extensively prescreened to rule out multiple alternative influences on blood glucose level. Of course, this strength may suggest a potential weakness in the design of the first study, in which participants were not prescreened. Each methodological option trades off certain benefits and liabilities. As a results of being extensively prescreened, the sample in study two was free of a number of other potential influences on blood glucose; however, this procedure results in a sample that is so healthy that it may not be truly representative of the population from which it was drawn. The sample in study one probably had greater ecological validity as a result of not being prescreened; however, some potential sources of error variance were therefore not controlled. Given that the population used in both studies was young and relatively healthy anyway, these distinctions may be inconsequential; with older populations or patient populations, however, the relative merits of screening versus not screening warrant attention.

Although both sample sizes were small, relative to mainline interpersonal communication research, they are within the norm for studies that measure on physiological parameters (e.g., Kurup & Kurup, 2003; Marazziti & Canale, 2004), including such studies done within the field of interpersonal communication (e.g., Tardy, Thompson, & Allen, 1989). The relative inability of the participants to introduce social desirability biases into the physiological measures of blood pressure or blood glucose level also argues for the validity of the findings even with the small sample size. However, the small sample size does raise valid concerns about statistical power and external validity. Concerns for power were assuaged by the emergence of significant associations with three out of four physiological parameters (systolic BP, diastolic BP, and HbA_{1c}). Concerns about external validity remain, however, demanding replication of the findings (which is currently underway in our laboratory).

In conclusion, even with received affection controlled for, expressed affection is significantly, and inversely, related to resting systolic and diastolic blood pressure and glycosylated hemoglobin. Because these parameters are elevated by chronic stress, the results suggest a direct association between the expression of affection and the body's efficiency at managing chronic stress in vascular and metabolic pathways. Future research will illuminate the extent to which any or all of these relationships are causal and the extent to which behavioral interventions founded on such relationships could be useful as complementary treatments for relevant physical disorders.

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