Human Affection Exchange: XIV. Relational Affection Predicts Resting Heart Rate and Free Cortisol Secretion During Acute Stress

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Participants in the present study reported the amount of affectionate communication characterizing the personal relationship they currently identified as their most affectionate relationship. The authors subsequently measured their resting heart rate and baseline salivary cortisol, and then exposed participants to a series of standard laboratory stressors. The authors monitored changes in the participants' heart rates and cortisol levels during exposure to the stressors. Results indicated that levels of verbal and supportive affectionate communication in the primary relationship were inversely associated with resting heart rate and with the magnitude of free cortisol increase in response to the acute stressors. The authors discuss implications for the association between relational communication and health.

Index terms: *affection, cortisol, heart rate, stress*

The motivation to be loved and appreciated is so pervasive that it has been called a fundamental human need, so it is unremarkable that receiving expressions of love and appreciation, in the form of *affectionate communication*, is associated with a host of mental, physical, relational, and psychosocial benefits.[1-2] For example, receiving expressions of affection from loved ones is associated with reduced risk of psychological distress, psychosomatic illness, alcohol abuse, physical aggression, loneliness, depression, and the enhancement of the body's ability to heal.[3-7] Affectionate behavior may impart benefits via multiple pathways. For instance, individuals who frequently give and receive affection tend to manifest high levels of self-esteem, happiness, and confidence, which may enhance their self-efficacy when it comes to tending to their physical and emotional needs.[8] Moreover, the frequent exchange of affection characterizes relationships that are emotionally close and interpersonally satisfying; partners in such relationships may also be particularly watchful of each other's health and well-being.[9]

A third viable pathway, only recently explored, involves the body's ability to protect itself against stress and to respond in adaptive ways to stressful situations when they arise. Although previous research has established that affectionate communication is inversely related to self-reported stress levels, we tested this prediction more directly by examining the association between affectionate behavior and 2 physiological markers of stress: heart rate (HR) and salivary-free cortisol.[8]

According to perspectives such as affection exchange theory (AET) and the stress buffering hypothesis (SBH), communication behaviors that build and maintain significant, intimate, and supportive social relationships should be inversely associated with susceptibility to stress.[2,10] One of

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the principal communicative behaviors in the development and maintenance of significant personal relationships is the expression of affection.[11–12] Consequently, we assert on the basis of AET and SBH that affectionate communication within significant relationships will buffer individuals against the negative effects of stress via its fortification of the fight-or-flight system and its ability to act as an important form of interpersonal support. Previous research on the association between affectionate communication and stress is described subsequently.

Affection and Stress

Correlational (nonexperimental) studies have confirmed that susceptibility to stress is inversely associated with affection received from others and affection conveyed to others.[13] Moreover, the number of hugs women receive from their romantic partners is inversely associated with their resting HR, and the tendency to communicate affection is directly associated with variation in 24-hour cortisol rhythms, a pattern indicative of healthy hypothalamic-pituitary-adrenal axis functioning.[14–16] Although the correlational nature of these findings precludes causal speculation, experimental investigations on the association between affectionate behavior and reactivity to stress have provided preliminary support for the claims of AET and SBH. For instance, expressing affection in written form to a loved one accelerated the reduction of cortisol during episodes of acute stress, relative to merely thinking about a loved one or doing nothing; hugging and holding hands with a loved one prior to a stressful experience reduced HR and blood pressure reactivity to the stressor, when compared with a control group.[17–18] These effects of affectionate communication are comparable for women and men.

In the present study, we extended these findings in 2 important ways. First, along with cardiologic activity, we measured endocrine activity (in the form of cortisol), so we could examine parameters of the stress response that were previously unexamined. In addition, we assessed how affectionate communication in a significant relationship is associated with baseline cardiologic and endocrine measures, as well as their reactivity to stressors. Thus, we provide information on the potential stress-mitigating influence of affectionate relational communication in stressful and nonstressful situations. Specific predictions and questions follow.

Hypothesis (H) and Research Question (RQ)

We examined how levels of affectionate communication in people's most affectionate relationships are associated with 2 physical parameters of stress: resting or baseline values for HR and cortisol, and the magnitude of HR and cor-

tisol reactivity in response to acute stressors. With respect to resting HR, several studies have shown a positive association between resting HR and stress.[19] To the extent that affectionate communication in participants' most affectionate relationships reduces susceptibility to stress, this should manifest itself in lower resting HRs (H1).

Although some researchers have shown a direct relationship between stress and baseline cortisol, others have demonstrated an inverse association.[20–21] Variability in these findings led us to ask what effect, if any, affectionate communication in the most affectionate relationship has with baseline cortisol level (RQ1). Finally, we ascertained the ability of affectionate communication to mitigate hormonal and cardiologic reactivity to acute stress, predicting that affectionate communication in the most affectionate relationship is inversely associated with the magnitude of cortisol increase (H2a) and HR increase (H2b) initiated by exposure to acute stressors.

METHOD

Participants

Participants ($N = 30$) were equal numbers of male and female communication students at a large university in the southwestern United States. Their ages ranged from 19 to 35 years, with an average age of 22.73 years ($SD = 3.81$). The majority ($n = 28$) was Caucasian, whereas one participant was Hispanic and one was African American.

Prescreening Procedures

We recruited participants from undergraduate communication courses for a "study of communication and stress." All who indicated an interest in being considered ($n = 168$) completed a screening questionnaire, which they subsequently sealed in an envelope and returned to the researchers. To protect participants' safety and to ensure the efficacy of the hormonal measurements, we enforced stringent inclusion criteria. In particular, all participants: (1) were normotensive; (2) were non smokers; (3) reported never having had chemotherapy or chest radiation; (4) reported no history of hepatitis, endocrine disease, kidney or liver disease, cancer, cardiovascular disease, rheumatologic disorders, respiratory problems, or diabetes mellitus; and (5) reported no current use of alpha-blockers, beta-blockers, or steroids. In addition, all female participants: (1) were nulliparous, (2) were not currently pregnant, and (3) were not currently breastfeeding. Slightly more than half of the prospective participants who returned a screening questionnaire ($n = 90$, or 53.6%) met all of the inclusion criteria and were deemed eligible for the study. Among these, we

randomly selected 15 men and 15 women, using a random numbers table, to receive invitations to participate. Those invited who were unwilling or unable to take part were replaced with randomly selected alternates drawn from the pool of eligible prospective participants. Male and female prospective participants were equally likely to be eligible for the study ($p > .05$).

Those who agreed to take part were scheduled for a 1.5-hour session in the communication sciences laboratory and were given a short questionnaire to fill out prior to their appointment. Participants were also told to abstain from alcohol and caffeine for at least 8 hours prior to their laboratory appointments, and from food, tobacco, and exercise for at least 1 hour prior.

Laboratory Procedures

The participant, an experimenter (one of the authors) who gave instructions and conducted the stress induction, and a technician who collected all physiological measures attended each laboratory session. When they arrived, participants completed a consent form and a form indicating their compliance with the instructions to abstain from alcohol, caffeine, food, tobacco, and exercise prior to their appointments. Had any participants indicated a failure to comply with one or more of these instructions, their laboratory appointments would have been rescheduled; however, all participants indicated their compliance with all directives. After completing paperwork and turning in their prelaboratory questionnaires, participants sat quietly for approximately 10 minutes to acclimate to the environment and achieve a resting HR. At this time, a technician returned to assess resting HR and to collect a saliva sample for the analysis of free cortisol. Technicians used Salivettes (Sarstedt, Inc., Numbrecht, Germany) to collect saliva samples. Participants were then told that they would be completing a series of moderately stressful activities and that the technician would continue to monitor HR and take saliva samples during the activities. The experimenter then administered the stress induction, which is described subsequently.

Stress Induction

Participants took part in 6 standard laboratory stressors: a cold pressor test, a mental arithmetic challenge, a stroop color word test, a second mental arithmetic challenge, a series of conflict video clips, and a second stroop color word test. The stress induction lasted approximately 40 minutes, and the technician measured HR and collected a saliva sample at the end of each stressor. Participants then were assigned to 1 of 3 experimental manipulation groups. These manipulations are irrelevant to the present analyses,

which focus only on endocrine stress *reactivity* and therefore consider the relationship between baseline HR and cortisol and the magnitude of their increases during the stress induction.

Affectionate Communication Measures

As part of the prelaboratory questionnaire, participants were asked to identify the person with whom they currently have the most affectionate relationship. Most often identified was a nonmarital romantic partner ($n = 13$) or a close platonic friend ($n = 10$). Also identified were a spouse ($n = 3$), a parent ($n = 2$), or a nonparental family member, such as a sibling ($n = 2$). There were no gender differences in the tendency to nominate any of these relationship types (all $p > .05$). Participants then reported on their affectionate communication in the target relationship, using the affectionate communication index (ACI).[22] The ACI is a factor-based self-report instrument indexing the extent to which a specific relationship is characterized by 3 forms of affectionate communication: verbal affection (eg, saying "I love you"; $\alpha = .91$), direct nonverbal affection (eg, kissing or hugging; $\alpha = .94$), and supportive affection (eg, doing favors for each other; $\alpha = .87$). The ACI has been extensively validated and evidences multiple forms of psychometric adequacy.[23]

Laboratory Assessments

Technicians measured resting HR in beats-per-minute (BPM) with the Omron HEM-630 (Bannockburn, IL) oscillometric automated blood pressure monitor. Clinical validation studies conducted in the United States and Japan indicate that the monitor is accurate to within ± 5% of pulse readings and meets standards established by the Association for the Advancement of Medical Instrumentation.[24] In our lab, this monitor's readings correlated at $r = .93$ with manually assessed (auscultatory) pulse readings. Concentrations for salivary free (unbound) cortisol were determined by commercially prepared coated-tube radioimmunoassay (RIA; MP BioMedicals, Irvine, CA 92618) in the university's exercise endocrinology laboratory. Inter- and intra-assay coefficients of variation were all below 10%.

RESULTS

Manipulation Check

To verify that the stress induction elevated free cortisol and HR levels significantly, we compared baseline (T1) levels to those observed during the 6 time periods of the induction (T2 through T7). The ANOVA for cortisol produced a significant main effect for time, $F (1, 22) = 6.82, p = .016$, partial $\eta^2 = .24$. The baseline measure of free cortisol was

1.008 ± 19.06 nmol/L, whereas the induction produced a mean cortisol value of 35.81 ± 15.15. No other main or interaction effects were significant. The ANOVA for HR returned a nonsignificant main effect for time, F (1, 27) = 2.16, p = .15, indicating failure of the stress induction to significantly elevate HR from baseline (71.75 ± 10.48 BPM) to induction (77.30 ± 11.13). Because of the failure of the induction to significantly elevate HR, we were unable to test H2b.

One form of affectionate communication, direct nonverbal affection, varied systematically according to the type of relationship on which participants chose to report, F (4, 21) = 22.24, p < .001, partial η^2 = .81. Post hoc analysis with the conservative Scheffé test indicated that relationships with parents (M = 5.88), spouses (M = 5.17), and non-spousal romantic partners (M = 6.05) were significantly more nonverbally affectionate than were relationships with friends (M = 2.78) or nonparental family members (M = 1.19). We therefore controlled for relationship type in the hypothesis tests involving nonverbal affection.

Hypotheses and Research Question

H1 called for inverse associations between resting HR and the amount of affectionate communication characterizing the most affectionate relationship. Observed resting HR values had an average of 77.30 BPM (SD = 11.13). As predicted, resting HR was inversely associated with verbal affection, r (28) = -.38, p = .02; and supportive affection, r (28) = -.35, p = .034. After controlling for the effects of relationship type, we found that HR was nonsignificantly associated with direct nonverbal affection, β = .02, p = .85. Therefore, H1 was supported for verbal and supportive affection.

RQ1 asked whether baseline cortisol is associated with affectionate communication in the target relationships. Baseline cortisol was significantly and directly associated with verbal affection, r (28) =.37, p = .027, but not with supportive affection, r (28) = .25, p = .11. After controlling for the effects of relationship type, we found that baseline cortisol was not significantly associated with nonverbal affection, β = .17, p = .14.

H2 predicted that the amount of affectionate communication characterizing the most affectionate relationship is inversely related to the magnitude of salivary cortisol increase (H2a) and HR increase (H2b) in response to acute stressors. Because the stress induction failed to significantly elevate HR over its baseline value, we did not test H2b. To address H2a, we first computed cortisol reactivity scores by subtracting baseline values from the aggregate of the stress induction values. The reactivity scores averaged 8.00 ± 15.17 nmol/L.

As predicted, cortisol reactivity was inversely associated with verbal affection, r (28) = -.46, p = .008; and supportive affection, r (28) = -.33, p = .048. After controlling for relationship type, we found that cortisol reactivity was inversely associated with nonverbal affection to a nearly significant degree, β = -.22, p = .06. H2a was supported for verbal and supportive affection.

COMMENT

Our results indicated that (1) verbal affection in the target relationship is directly related to baseline cortisol and inversely related to resting HR and cortisol reactivity; (2) supportive affection is inversely related to resting HR and cortisol reactivity; and (3) nonverbal affection was unrelated to baseline HR, baseline cortisol, and cortisol reactivity when relationship type differences were controlled. The results for verbal and supportive affection are of particular relevance because they contribute to a growing literature attesting to the associations between relational communication and physical health. A host of researchers, for instance, has demonstrated that patterns of engaging in marital conflict are differentially beneficial, or detrimental, to cardiovascular health, hormonal regulation, and immunocompetence.[25-26] Research in nonverbal communication has similarly indicated a number of health benefits associated with touch.[27] Our demonstration that verbal and supportive affectionate communication in the most affectionate relationships predicted, in particular, lower resting HRs and lower cortisol responses to stress adds to this literature, and this literature is consequential to interpersonal communication scholars because it significantly bolsters the case for the utility of studying interpersonal behavior. To the extent that researchers can identify ways of communicating in social and personal relationships that are beneficial to people in terms of their physical health, mental health, or other arenas of value, then the utility of interpersonal communication research is strongly fortified. We believe that studies such as the present experiment contribute to this broader goal.

Implications

When we considered the results of the current study in the context of previous findings, our results support the implication that affectionate behavior in close relationships is beneficial to health and well-being. This conclusion is certainly in line with research demonstrating associations between health and more general social or emotional support in personal relationships, but in the present study, we extend these more general findings by identifying specific types of behavior—namely, the communication of affection through direct verbal expressions and through supportive behaviors—that

elicit the fortification effects hypothesized by AET and SBH. This supports the possibility that increasing affectionate behavior, at least within close personal relationships, may precede improvements in cardiovascular health and endocrine function. Future prospective studies will be able to evaluate the efficacy of such a course for improving various health outcomes; if such effects were demonstrated, then this could be an effective nonpharmacological intervention, particularly for those dealing with chronic stress. Such research is currently under way in our lab.

Strengths and Limitations

Two principal strengths characterize the present study, the first being our use of an experimental design that allows for examination of the effects of relational affection not only on baseline health measures but also on actual stress reactivity. This is an important characteristic because relational communication patterns that covary with health parameters do not necessarily predict how those parameters will change when challenged. Given that exaggerated physiological reactivity to stressors is a warning sign for cardiovascular and coronary heart disease, the ability to examine affectionate communication's relationship with stress reactivity was an important consideration. The other strength of our study is that unlike some earlier studies of the benefits associated with affectionate behavior, the present study is distinguished by our use of objective physiological markers of health and stress reactivity. These forms of measurement are important additions to this body of research, given that, in comparison with pencil-and-paper measures, they are less under the conscious control of participants, relatively exempting them from social desirability biases. Most important, the congruence in results from self-report and objective physiological measures adds to our confidence in the association between affectionate behavior and health.

As a result of our recruitment and prescreening procedures, the current sample was young and healthy. We enforced stringent inclusion criteria to preserve the efficacy of the hormonal measurements and to protect participants from undue risk from exposure to the acute stressors; however, this also results in a sample that may deviate in consequential ways from the population from which it was drawn. It bears noting that physiological studies with lesser controlled samples have also produced results supporting the connection between affectionate communication and health; however, this feature of the present study does raise the possibility that the observed effects would fail to manifest—or, indeed, would manifest to a greater degree—in other samples drawn from the same population.[15] The possibilities await empirical investigation.

NOTE

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