Warm Partner Contact Is Related to Lower Cardiovascular Reactivity

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The authors investigated the relationship between brief warm social and physical contact among cohabitating couples and blood pressure (BP) reactivity to stress in a sample of healthy adults (66 African American, 117 Caucasian; 74 women, 109 men). Prior to stress, the warm contact group underwent a 10-minute period of handholding while viewing a romantic video, followed by a 20-second hug with their partner, while the no contact group rested quietly for 10 minutes and 20 seconds. In response to a public speaking task, individuals receiving prestress partner contact demonstrated lower systolic BP, diastolic BP, and heart rate increases compared with the no contact group. The effects of warm contact were comparable for men and women and were greater for African Americans compared with Caucasians. These findings suggest that affectionate relationships with a supportive partner may contribute to lower reactivity to stressful life events and may partially mediate the benefit of marital support on better cardiovascular health.

Index Terms*: cardiovascular reactivity, marital support, touch*

A large body of evidence suggests that social relationships influence health. Across a number of cross-sectional and prospective studies, increased social integration and more positive social interactions have been associated with better health and physiological profiles characterized by reduced levels of blood pressure, cardiovascular reactivity, stress hormones, and immune system dysfunction.[1–3] Conversely, a lack of positive social ties is related to poorer health, increased vulnerability to disease[4] and reduced longevity.[5,6] To be more specific, the link between social support and cardiovascular outcomes has been consistently supported. Lower levels of support have been prospectively linked with greater cardiac[7] and all-cause mortality and greater incidence of coronary heart disease (CHD)[8] in nonpatient samples and to greater likelihood of future myocardial infarction (MI), more cardiovascular procedures, and increased risk of cardiac mortality in patients with preexisting cardiovascular disease (CVD).[8,9]

Large-scale studies have also suggested that marriage, one of the most central sources of support, has a salutary effect and that bereavement and divorce have a negative impact on cardiac and overall health. Married persons are at reduced risk for all-cause and post MI death,[10–17] whereas divorce is linked to increased total and cardiovascular mortality[15,18] and impaired physical and psychological health.[19] Although findings are mixed, many studies report that a greater "marriage benefit" accrues to men,[11,15,20] and that men are more adversely affected by marital disruption.[5,21] However, not all marriages are equally advantageous.[22] The quality of the marital relationship appears to play an essential role in health outcomes,[23,24] with greater levels of marital distress linked to enhanced health risk.[13,25–27] For example, in mildly hypertensive men and women, poor marital adjustment has prospectively predicted greater increases in left ventricular mass (LVM), a potent risk factor for cardiovascular mortality.[27–29] In addition, although men seem to receive greater health benefit

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from being and staying married, women appear particularly susceptible to the health disadvantage associated with marital conflict and relationship dissatisfaction.[23,30,31]

Several potential mechanisms mediating these relationships have been suggested by epidemiological reports. Strong networks and supportive relationships may foster better health behaviors, or healthier individuals may attract and have the resources to engage in more social interactions and activities. Studies adjusting for some of these effects, however, indicate that the benefit of support is not entirely explained by these factors.[32] Therefore, the direct effects that social relationships exert on physiological processes, particularly during stress, is another important focus of researchers interested in the link between social ties and CVD.

Social support is thought to confer health advantage, in part, through attenuation of cardiovascular and neuroendocrine responses to stress. Better support buffers stress responses by rendering an individual's cognitive appraisals of stressful events as less harmful and threatening,[6] and these altered appraisals, in turn, lessen physiological responses.[33] Because greater frequency, intensity, and duration of cardiovascular responses to life's many challenges have been linked to acceleration of the onset and progression of coronary artery disease (CAD), hypertension (HTN),[34] and CHD,[35] these support-mediated decrements in reactivity may be one way that better relationships foster healthier cardiovascular outcomes.

The social support–reactivity association has been examined using discrete exposures to various forms of emotional support in a number of well-designed experimental studies (See Lepore, 1998,[36] and Uchino, 1996,[32] for reviews). Many protocols have used active coping challenges such as public speaking or mental arithmetic to test the effects of support manipulation on stress responses, primarily in female college students. Although findings are not fully consistent,[36,37,38] growing evidence suggests that reactivity is higher within negative versus neutral social environments and is attenuated along a continuum of increasing emotional support. That is, the presence of a provoking stranger during stress elicits greater systolic BP (SBP) and heart rate (HR) responses compared with that of a neutral or supportive stranger.[39] Greater reactivity is also demonstrated when individuals undergo laboratory stress alone versus with a supportive stranger,[40,41] which, in turn, is associated with greater or equivalent reactivity compared with support from a personal friend.[36,40,42] Other studies have shown that social support mitigates the negative effects of age[43] and hostility[44] on cardiovascular variables and interacts with relationship quality,[45] gender of the support provider,[46] Type A personality, and other contextual factors.[29]

Experimental studies of the effects of marital interactions on reactivity have generally monitored cardiovascular and neuroendocrine changes during spousal conflict (see Kiecolt-Glaser, 2001,[47] for review). In brief, marital conflict elicits pronounced and prolonged elevations in BP, HR, and stress hormones, with women often exhibiting greater reactivity to marital discord compared with men.[47–51] These changes are enhanced in those who report marital dissatisfaction or who use more hostile negative behaviors during the confrontation.

Although many studies have linked hostility and conflict to greater reactivity during couple interactions, very few have investigated the effect of positive spousal contacts on cardiovascular responses as a potential mediator of the marriage benefit. Gump[18] has reported that 24-hour ambulatory BP (ABP) was lower in both men and women during interactions with a spouse compared with other types of social interactions in ecologically valid settings. Baker[25] has also reported that men and women with high marital satisfaction who spent more time ($\geq$ 4 hours per day) with their spouses had lower ABP than those who spent less time together. Those with low marital satisfaction, however, had lower ABP only if they spent less time with their stressful mates.[25] In contrast, when Ewart and colleagues[49] compared reactivity to negative, neutral, and positive or affectionate spousal interactions in a laboratory conflict task, they found that negative marital exchanges were associated with BP changes, but neutral and positive interactions were not. The effects that nonsexual but affectionate physical contacts, such as handholding and hugging, play in fostering better health profiles in married or partnered individuals is also largely unexamined. In animal studies, pleasant tactile contacts have been shown to alter stress responses by enhancing vagal tone and reducing sympathetic nervous system activity, thus promoting relaxation and/or sedation and lower BP.[52] Moreover, in humans, the effects of touch or massage have been linked to improved sleep,[53] reduced anxiety, and lower cortisol,[52,54] SBP, diastolic BP (DBP), and HR,[55–57] although responses appear to vary based on the contextual characteristics of the contact.[28,29]

In summary, although bad marriages appear to be a significant source of risk, the mechanisms by which good marriages contribute to health have been less thoroughly explored. Few experimental studies have examined the physiological correlates of positive spousal interactions, and to our knowledge, the effect of affectionate contact with a spouse on cardiovascular reactivity has not been previously reported. Therefore, our purpose in the current report was to compare BP and HR responses to stress in men and women receiving a pleasant, positive contact versus no contact with a partner or spouse, prior to a stressor. We hypothesized that positive warm interaction before stress would attenuate subsequent BP and HR reactivity. We were also interested in whether the effect of partner support on reactivity would differ between men and women, given previous reports that (1) emotional support from women but not from men attenuates stress responses in participant or confederate dyads,[46] (2) women demonstrate greater cardiovascular responses to negative marital interactions, and (3) men generally exhibit greater reactivity to other types of laboratory stress, particularly those involving achievement.[58] Finally, we were interested in potential racial differences in the effects of warm contact with a partner on stress reactivity, given the greater cardiovascular reactivity to stress reportedly demonstrated by African Americans versus Caucasians.[34]

METHOD

Participants

We recruited normotensive to mildly hypertensive volunteers from the Raleigh/Durham/Chapel Hill area by poster and newspaper advertisement. The sample consisted of 74 women and 109 men (66 African American, 117 Caucasian). Participants ranged in age from 19 to 50 years old and were required to be either married or cohabitating with a significant other for at least 6 months. Individuals currently taking antihypertensive or antidepressant medications were excluded from participating, as were pregnant or breast-feeding mothers.

Procedures

Each volunteer read a description of the protocol, approved by the local review board, and provided written informed consent. Participants were paid for their participation. We divided the participants into two groups: warm contact (100) or no contact (85). On the lab day, participants wore an ABP monitor. Following a 5-minute rest period, a trained technician assessed baseline BP and HR measures with a series of stethoscopic measurements taken concurrently with the ambulatory monitor. The last 3 acceptable readings, taken no less than 1 minute apart, were averaged for the reported baseline values. Participants then underwent the 10-minute prestress contact period, either alone or with their partner, based on their warm contact versus no contact designation. All participants then participated in a speech task stressor without their partner present.

Instrumentation

Participants wore the Suntech Accutracker II ABP monitor (Raleigh, NC). Three spot-electrodes were placed on the chest, and a piezo-electric microphone, encased in an adhesive pad and covered with the BP cuff, was used to assess Korotkoff sounds over the brachial artery. While the participant was seated in a comfortable chair, a technician took at least 3 Accutracker readings while concurrently assessing BP with a stethoscope and mercury sphygnomanometer to confirm Accutracker accuracy. After the assessment was completed, Accutracker II data were downloaded using AccuWin, software designed by Suntech to retrieve and report data obtained with the monitor. We analyzed the data for outliers and edited it, as per the method described by Harshfield,[59] using Microsoft Excel.

Warm Contact Condition

Participants in the warm contact group underwent a 10-minute period of close contact. They sat together on a loveseat and were asked to be touching in some way that was comfortable for both of them. They were secluded in a small room where they spent 4 minutes talking about a positive experience they shared during their relationship that brought them closer together as a couple and then 5 minutes viewing a segment from a romantic video. When this session was completed, a technician from outside of the room asked the couple to stand and engage in a 20-second hug. The no contact group rested quietly alone for 10-minutes and finished by standing alone for 20 seconds. Following this condition, subjects immediately underwent the speech task (warm contact participants were immediately separated after the hug).

Speech Task

Participants were required to give a 3-minute, tape-recorded speech, describing a recent interpersonal situation that caused them to feel anger or stress. They were given 2 minutes to silently prepare and 3 minutes to deliver the speech. They were then immediately required to listen to the audiotaped replay of their speech. BP and HR readings were taken at minute 1:00 of the preparation, minutes 0:00 and 1:30 of the speech delivery, and 0:00 and 1:30 of the replay. Two staff members acted as an audience during this task.

Data Analyses

Unpaired *t* tests were used to examine warm contact versus no contact group differences in mean age, body mass index (BMI), and baseline SBP, DBP, and HR. The Chi-square statistic was used to test group differences in gender and race. Reported BP and HR values for speech and replay are the average of 2 readings taken during each of those conditions, and baseline readings are the average of the last 3 readings taken. BP and HR reactivity values were calculated as delta scores (mean speech level–mean baseline level). Separate repeated measures analyses of covariance (ANCOVAs) with task as the 2-level within-subject factor (speech, replay) and warm contact as the 2-level between-subjects factor were used to test the effect of prestress warm contact with a partner on SBP, DBP, and HR reactivity across both periods, adjusting for age, sex, race, and baseline value. In cases where a significant main effect of warm contact was observed, the interactions of Race × Warm Contact and Gender × Warm Contact on BP and HR responses were then tested using separate 2 × 2 repeated measures ANCOVAs, adjusting for covariates, to examine gender and racial differences in the pattern. Because of technician error, complete HR values were available in a reduced number of participants (71 warm contact, 68 no contact).

RESULTS

Characteristics of Warm Contact and No Contact Groups

When we categorized participants on the basis of their experience of warm contact versus no contact with a spouse or a partner prior to the experimental stressor, we observed no group differences in BMI, baseline DBP, race, or gender. However, Table 1 shows that compared with those receiving warm contact, the no contact group were older and demonstrated significantly lower mean baseline SBP and HR. Thus, we performed adjustments for any differences associated with age or baseline levels in all reactivity analyses.

BP and HR Reactivity Across Speech and Replay in Warm Contact and No Contact Groups

Repeated measures ANCOVAs revealed significant main effect of warm contact on SBP, $F(1, 179) = 28.78$, $p < .0001$; DBP, $F(1, 179) = 9.36$, $p < .003$; and HR, $F(1, 129) = 13.42$, $p < .0004$, across the 2 conditions. Subsequent examination of least square mean comparisons revealed that prestress warm contact was associated with significantly smaller BP and HR responses during the active speaking task, compared with no contact. Figure 1 shows smaller mean elevations in SBP (11.07 vs. 22.03 mm Hg) in the warm contact group during the speech, which were maintained during passive listening to the audio-taped replay (5.83 vs. 10.98 mm Hg). Figures 2 and 3 depict smaller mean elevations in DBP (10.06 vs. 14.87 mm Hg) and HR (5.07 vs. 10.37 beats per minute) during the speech in warm contact versus no contact groups, respectively. Among the covariates, we observed a significant main

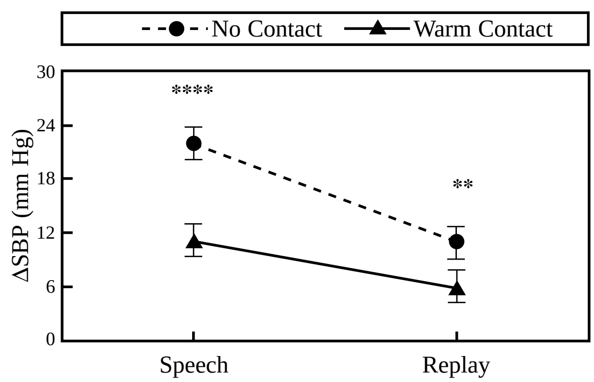

FIGURE 1. Changes from baseline systolic blood pressure (SBP) during speech and replay by prestress warm contact and no contact groups. **$p < .01$. **** $p < .0001$.

TABLE 1. Descriptive Characteristics of Warm Contact and No Contact Groups

Variable	Warm contact *n* = 100	No contact *n* = 85	*t* (181)	χ^2
Age (y)	28.92 ± 7.14	34.71 ± 7.88	5.24****	
BMI (kg/m^2)	26.78 ± 6.65	27.02 ± 5.59	1.48	
Baseline SBP (mm Hg)	123.76 ± 11.84	116.68 ± 14.74	–3.62***	
Baseline DBP (mm Hg)	76.41 ± 9.02	76.71 ± 11.49	0.20	
Gender (% Female)	50.0	50.6		0.014
Race (% African American)	25.0	33.0		1.42

Note. Reported values are mean + SD. BMI = body mass index. SBP = systolic blood pressure. DBP = diastolic blood pressure. Reported baseline SBP and DBP are the average of 3 readings taken at least 1 minute apart following at least 5 minutes of seated rest.
***$p < .001$. ****$p < .0001$.

effect of age on DBP reactivity, F(1, 179) = 4.87, $p < .05$, and a marginal relationship of age with SBP reactivity, F(1, 179) = 2.62, $p < .11$, was also present. Gender, F(1, 129) = 5.06, $p < .05$, and race, F(1, 129) = 13.76, $p < .0005$, were independent predictors of HR reactivity. Baseline values significantly predicted DBP, F(1, 179) = 6.82, $p < .01$, and marginally predicted SBP, F(1, 179) = 2.65, $p < .11$.

Effects of Gender and Race on Reactivity in Warm Contact and No Contact Groups

We saw no significant interaction effects of Gender × Warm Contact on BP or HR responses. Figure 4 illustrates that the benefits of prestress warm contact with a partner on BP reactivity during the speech were comparable for men and women.

We observed a significant interaction effect of Race × Warm Contact on SBP reactivity, F(1, 178) = 4.25, $p < .05$. Figure 5 illustrates that although warm contact was associated with significantly smaller SBP response in both races, African Americans appear to derive greater benefit during both active speech and passive replay.

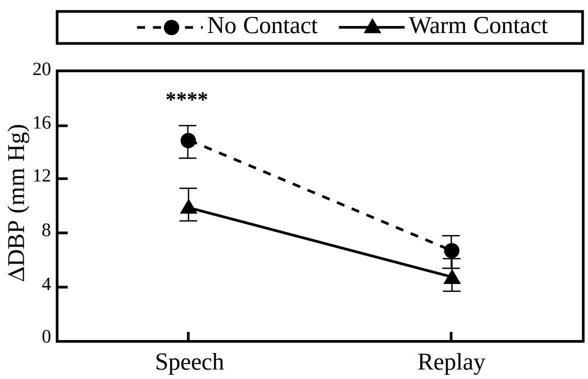

FIGURE 2. Changes from baseline diastolic blood pressure (DBP) during speech and replay in prestress warm contact and no contact groups. ** *p* < .0001.**

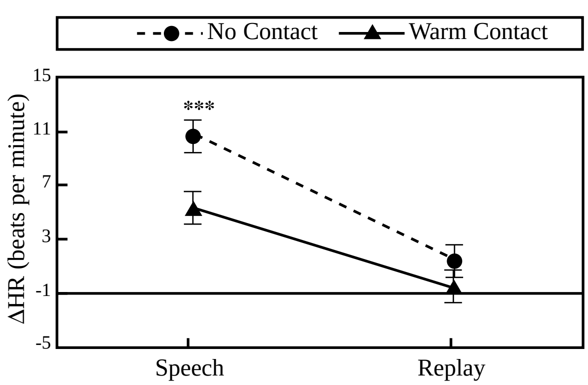

FIGURE 3. Changes from baseline heart rate (HR) during speech and replay in prestress warm contact and no contact groups. ****p* < .001.

COMMENT

The results of this study demonstrate that a brief positive interaction with a spouse or a partner has a direct effect on subsequent BP and HR responses to a stressful interpersonal event. In our analyses, both BP and HR reactivity was reduced (by approximately half) in men and women who experienced a 10-minute period of affectionate social and physical partner contact prior to the stressor (giving a tape-recorded speech), compared with those who rested alone for 10 minutes preceding the task. These data are consistent with other findings that spousal versus other social contact

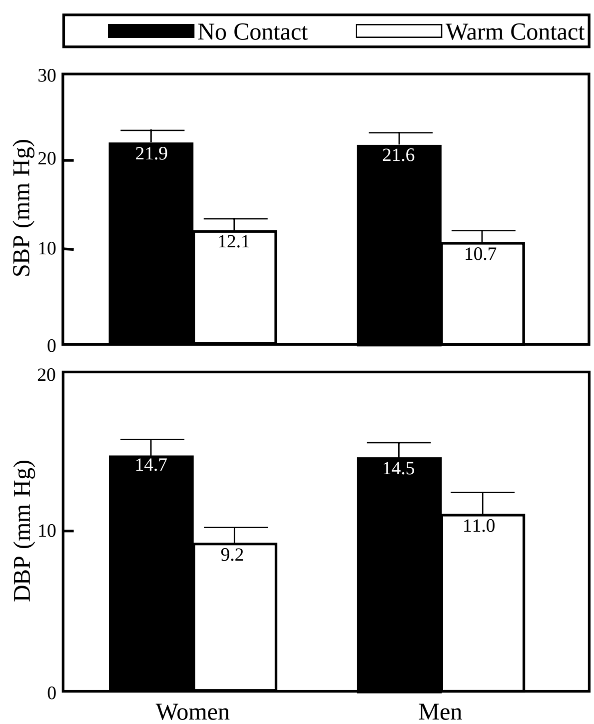

FIGURE 4. Changes from baseline systolic blood pressure (SBP) and diastolic blood pressure (DBP) during speech in men and women in prestress warm contact and no contact groups.

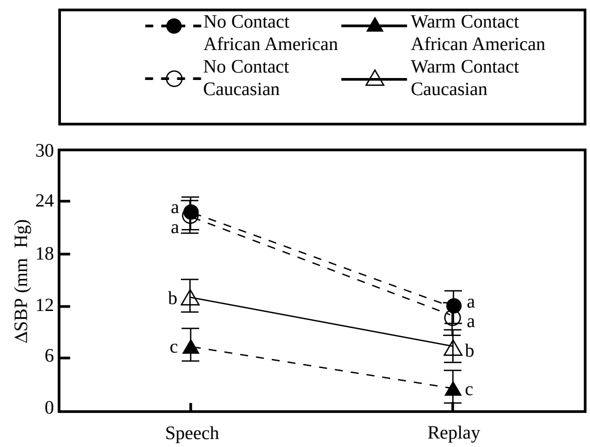

FIGURE 5. Changes from baseline systolic blood pressure (SBP) during speech and replay in African Americans and Caucasians receiving prestreess warm contact versus no contact. Significant differences between a, b, and c are at the level of *p* < .05.

is associated with lower mean ABP,[18] and that positive feelings about the relationship (marital satisfaction) are associated with health benefits[24] including smaller increases in LVM over time.[25]

It should be noted that the observed attenuation of BP responses occurred despite the fact that the supportive partner had already left the room. This is consistent with Kamarck and colleagues'[29] report of a "carryover effect" of positive support on subsequent reactivity. In their study, female college students who received support during mental arithmetic and concept formation tasks demonstrated smaller DBP responses to an ensuing stressful interview compared with women who underwent the preceding tasks alone. Although that protocol differed from our own in important ways, it is of interest that, like ours, the support condition included a tactile component, in their case a sustained touch on the wrist delivered by a friend throughout the support period.

It is important that we observed an equivalent benefit of warm contact in men and women on BP and HR reactivity. These findings are in contrast to enhanced responses to spousal conflict demonstrated by wives compared with husbands reported in marital interaction studies. Although wives may be more responsive to marital discord, our results suggest that both genders receive similar physiological advantage from positive intimate contact. Glynn and colleagues[46] reported previously that social support from a woman, but not from a man, was associated with reductions in BP responses. The results of the current study suggest that when partners rather than confederates provide support, and where the exchange is designed to enhance feelings of closeness and affiliation, both genders are effective at giving and receiving the cardiovascular benefits of warm contact.

Another unique contribution of this report is the detection of greater benefit of warm contact in African American men and women compared with Caucasians. Few psychophysiological studies have reported an influence of social support on reactivity in African Americans; however, data from some large-scale studies suggest that support may buffer cardiovascular risk[60,61] in African American populations. To our knowledge, this is the first study to show greater benefit of social support in African Americans compared with Caucasians on reactivity to experimental stress. Because previous research indicates that compared with Caucasians, African Americans report more stressors in daily life,[60] respond with greater BP elevations to laboratory stressors,[34] and are at higher risk of hypertension and cardiovascular disease,[62] this result warrants further investigation.

One strong point of the current study is the examination of the largely unexplored effect of positive partner interaction on cardiovascular stress responses as a potential mediator of the known health advantage attributable to marriage and marital satisfaction. An important component of the protocol design was that warm contact was terminated prior to the speech task, with all participants undergoing the stressor alone. This eliminated the possibilities that the touch or presence of the partner might be a distraction from the stressor and that fear of negative evaluation might nonrandomly alter participants' responses. A limitation of this study is that prestress contact groups differed significantly in age and baseline SBP; however, we controlled statistically for these factors, and the higher baseline SBP exhibited by the warm contact group more likely would be related to greater reactivity, which is the reverse of our finding. A second limitation is that although positive contact with a partner may have reduced cognitive appraisals of the stressfulness of both the tasks and the laboratory experience in general, we did not assess subjective perceptions of stress. Finally, because we did not monitor BP during recovery, we cannot assume that this effect is maintained during the posttask period.

In summary, we found smaller SBP, DBP, and HR responses to a speech task about an anger-inducing social interaction in men and women receiving warm contact from a partner prior to the task. This benefit was comparable in men and women and greater in African Americans compared with Caucasians. The implications of the current results are that couples who enjoy more episodes of positive close contact may respond with lower BP and HR elevations to the stresses and strains of daily living, which may cumulatively contribute to lower LVM and overall cardiovascular risk over time. The reduced cardiovascular impact of these consistently smaller bouts of stress-induced reactivity may be one mechanism by which the epidemiological findings of reduced health risk in married individuals, particularly in those with better marital adjustment and satisfaction, are mediated.

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NOTE

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