Dossier: Stress

Social support and cardiovascular reactivity

N. Christenfeld*, W. Gerin

1 Department of Psychology, University of California, San Diego, La Jolla, CA 92093-0109; 2 Mount Sinai Medical Center, New York, NY, USA

Summary – Recent experimental work on the benefits of social support in buffering cardiovascular stress responses builds on prior epidemiological, psychological, and physiological work. Epidemiological data show that social integration is associated with better health, but cannot unambiguously establish causality (it could be that healthy people attract more friends), nor that the mechanism is psychological (the mechanism could be behavioral; for example, with friends encouraging exercise). Social psychological work suggests that people prefer to be with others, especially in times of stress, and that they evaluate themselves, and their emotional responses, by observing the people around them. This work, while establishing a desire for affiliation, does not show that being with others translates into health benefits. Physiological evidence suggests that exaggerated cardiovascular responses to stress are associated with the development of hypertension and cardiovascular disease, but does not indicate how such potentially damaging stress responses can be reduced. Experimental work on social support and cardiovascular reactivity overcomes many of these limitations. The presence of an ally, especially a female, markedly reduces cardiovascular responses compared both to the presence of a non-supportive other, and to experiencing the stress alone. One fruitful area for further work is the role of social support following stress, both in speeding the cardiovascular return to pre-stress levels, and in limiting rumination-induced cardiovascular responses.

affiliation / cardiovascular reactivity / social support

SOCIAL SUPPORT AND CARDIOVASCULAR REACTIVITY

People in the midst of stressful experiences will show often quite dramatic cardiovascular responses. This reactivity can occur even in the absence of physical activity. For example, a person who sits still and expects, though never receives, an electric shock will show systolic blood pressure levels that are 18 mmHg higher on average than those shown by the same individual sitting quietly without any threat of shock [12]. In the past 10 years, researchers have begun to examine the ways that the presence of other people, often friends or supportive strangers, can alter these stress responses. The experimental work on social support and cardiovascular reactivity builds on three separate previous bodies of work: epidemiologic findings connecting social integration to health; social psychological theories suggesting that people derive comfort from contact with others; and medical research linking acute blood pressure increases to long-term cardiovascular damage and disease. We will review each of these before discussing the conditions under which the presence of others can be beneficial to a person under stress.

EPIDEMIOLOGIC FINDINGS CONNECT SOCIAL INTEGRATION TO HEALTH

There are two types of epidemiologic evidence which link social support to health. The first comprises studies relating the size of people’s social networks with their risk of premature morbidity or mortality. For example, Berkman and Syme [2] conducted a longitudinal study of almost 7,000 people in Alameda County, California. The people who were most socially isolated at the outset were more than twice as likely to die during the 9-year study period as those with the greatest number of social and community ties. This finding is quite robust, and has been shown in other US studies [15], as well as in other countries [29, 30].

The other type of epidemiologic evidence for a connection between social contacts and health comes from studies of marriage and bereavement. These studies report that, in general, people who are married live longer than those who are single. For example,
House et al. [15] found that unmarried men experienced almost twice the risk of premature mortality as married men. Similarly, Wiklund et al. [38] found that the estimation of risk of death for single men who have suffered a first myocardial infarction is roughly double that of their married counterparts.

 Unlike the work on social integration, the studies that focus on marriage often find evidence of a gender difference. While married men consistently do better than single men, the health benefits of marriage for women are often small or nonexistent [2, 15]. Paralleling the research on the benefits of marriage, the epidemiologic research on the effects of bereavement and widowhood suggests that the loss of a spouse may be associated with more negative outcomes for males than for females [14, 28, 37]. Overall, women appear to benefit as much as men from social networks, but benefit little if at all from marriage and suffer relatively few health consequences of bereavement. These findings are consistent with the notion that men are not especially good at providing effective social support. However, the epidemiologic evidence is not particularly well suited to answering this question. The sex composition of people’s social networks is generally not assessed, and the fact that women always marry men makes it impossible to tell whether husbands do not provide support in the same way that wives do, or whether women fail to benefit from support that is provided. We will return to the issue of gender differences in social support.

 There are two types of questions that cannot be addressed by the correlational findings linking social integration and health. The first is whether the relationship is causal, with social integration actually promoting health. The causality could run the other way. Healthy people may be involved in more activities, and so form more social contacts. Healthy people may also be more appealing as friends or spouses (possibly because they spend less time talking about dull medical conditions). While epidemiologic studies can statistically control for the potentially confounding effects of prior health and health-related behaviors such as smoking and overeating, these data can only suggest, but by no means prove, that social contact promotes health and prolong life.

 The second type of question that cannot be addressed by correlational studies concerns the identification of pathways, or mechanisms, through which social support or integration may affect health. Social support may be beneficial because it encourages health-promoting behavior, such as quitting smoking or losing weight. Or social support may operate through psychological mechanisms: social support could buffer the effects of the stressors of everyday life by helping the recipient remain calmer and less aroused during stressful situations. In short, the epidemiologic evidence strongly indicates that social support is associated with better health, but cannot demonstrate that this is a causal link, or that the mechanism is in reducing the effects of psychological stress.

### Psychological Theories Suggest People Derive Comfort from Contact with Others

The second body of work that gave rise to experimental investigations of social support and cardiovascular reactivity is the psychological research on social comparison and the need for affiliation. One of the central tenets of Festinger’s social comparison theory [7] is the proposition that people have a strong motivation to evaluate their abilities and opinions. That is, people want to know whether they are reasonably good at some task and they want to know whether their opinions about some event or object are reasonable. While this is sometimes possible by actually checking the objective state of the world – one can find out if alligators are dangerous by swimming with them – more often people rely on social information, comparing their abilities and attitudes with those of others.

Schachter [32] suggested that the desire for social comparison is especially strong when people are in novel or stressful situations. He demonstrated this by leading experimental participants to believe that they would soon experience either a mild or a severe electric shock, and then asking whether they would like to wait for the shock alone or with other people. The participants who expected to feel only a slight tingle were indifferent, but the ones who faced the severe threat chose overwhelmingly to be with others, particularly when those others were also facing the high shock threat.

One implication of social comparison theory and the need for affiliation is that the social context in which people happen to find themselves can have a tremendous impact on their behavior. People do not evaluate themselves in comparison with the world in general, but instead look to those immediately around them. In school settings, for example, this process leads students attending worse schools to feel better about their academic capabilities (in spite of lower actual academic achievement) because they compare themselves to their immediate peers who are not excelling [27].

Many studies of affiliation, including Schachter’s original work, focused on the desire to be with others,
not on the results of affiliation [21]. However, there is some work examining the effects of affiliation. Schachter’s later work on emotions falls in this category [33]. His theory suggested that all emotions are based on a common state of physiological arousal, and that people judge which particular emotion they are experiencing by looking to the context, especially the social context. Thus, he argued, people experiencing an internal state of arousal will feel euphoric if they happen to be with other people who appear euphoric, but will be angry if they happen to be with others who appear angry.

In general, social comparison theory suggests that the presence and nature of others can have a profound influence on a person’s emotional reactions. This is especially likely to be true during times of stress or uncertainty. However, establishing the presence of a desire to be with others is not the same as showing that being with others confers a benefit in terms of stress reduction, or that such a benefit has physiological correlates.

**CARDIOVASCULAR REACTIVITY AS A POSSIBLE CAUSE OF HYPERTENSION AND CORONARY ARTERY DISEASE**

The last of the three bases for experimental work on the psychophysiological sequelae of social support concerns the reactivity hypothesis. In its most general form, the reactivity hypothesis suggests that large blood pressure responses to stress are associated with hypertension and coronary artery disease [20, 31]. The weak version of the reactivity hypothesis suggests that exaggerated cardiovascular responses to stress are associated with, but do not necessarily cause, future cardiovascular disease. Thus, the greater physiological responses that are observed may be symptoms of an already damaged system, or a system that, for other, possibly unknown reasons, is susceptible to damage. The strong version of the hypothesis, however, suggests that it is the cardiovascular responses themselves that, cumulated over thousands of stressful events, directly influence the development of disease.

One form of the reactivity hypothesis may be viewed as the “personality” model, which suggests that the people who show exaggerated cardiovascular responses are the same people who are at elevated risk of later disease. A different form of the hypothesis, however, the “social psychology” model [5], is more relevant to experimental work on social support. Rather than focusing on individual differences in reactivity, the social psychology model suggests that some situations are more likely than others to cause large blood pressure responses, and thereby, contribute to later disease.

An important implication of this model is that limiting a person’s exposure to situations that produce large physiological responses, or reducing the responses that those situations tend to produce, will promote long-term cardiovascular health.

The empirical evidence linking exaggerated cardiovascular responses to later disease is not overwhelming. The best evidence comes from work on cynomolgus macaques. Macaques who are classified as high reactors show more atherosclerosis after repeated stressor episodes than do low-reactor macaques [25, 26]. Furthermore, adding stress, by disrupting the social environment, increases cardiovascular damage [18, 19]. However, although these data support the reactivity hypothesis, no manipulation of reactivity itself was ever accomplished. The connection between reactivity and disease is still the subject of some controversy [31].

One difficulty in finding empirical support for the personality form of the reactivity hypothesis is that there must be some cross-situational stability in people’s cardiovascular responses to stress [9]. If the responses are not stable across situations, it is useless to attempt to classify a particular person as a “high” or “low” reactor. If the people who have the largest cardiovascular responses to work stress are not the same ones who show large responses to marital stress, then it is not clear who should be at risk for later disease. Several studies have shown that cardiovascular responses often do not generalize across stressors, or from the laboratory to the real world [8, 11, 31].

The direct evaluation of the “social psychology” form of the reactivity hypothesis model does not suffer from the same problems of cross-situational stability as the personality view. However, demonstrating that stressful situations lead to heart disease because they cause exaggerated cardiovascular responses remains a daunting task, because this hypothesis does not readily lend itself to experimental investigation. For the most part, this version of the reactivity hypothesis has rested on the same evidence as the individual difference view: that people who show exaggerated cardiovascular responses are at increased risk for development of disease. The personality view is useful in that it has the potential to identify people who are at increased risk for hypertension and coronary heart disease. In contrast, the social psychological view identifies situations that can promote cardiovascular disease. Identifying such situations is useful because it may lead to intervention strategies that reduce the pathogenic effects of exposure. It is possible that the damage due to blood pressure elevations can be mitigated if methods can be found to buffer the cardiovascular response that
stressful situations engender. The reactivity hypothesis, however, does not itself suggest what might buffer such reactivity.

**SOCIAL SUPPORT AND THE BUFFERING OF CARDIOVASCULAR REACTIVITY**

The notion that social support can reduce the cardiovascular responses of people exposed to stress fits neatly into the theoretical framework provided by the three areas of work that have been reviewed. The epidemiologic evidence suggests that social support is associated with health, but cannot clearly establish causality, or a psychological mechanism. By manipulating social support, and keeping the overt physical behavior of the person under stress constant, experimental investigations of social support are able to avoid these limitations. The social psychological theories on the need for affiliation and social comparison suggest that people prefer to be with others, and evaluate their attitudes and emotional states from their immediate context. However, these theories do not directly address the effects of affiliation and social comparison on cardiovascular outcomes. Finally, the reactivity hypothesis suggests that exaggerated blood pressure responses are damaging, but does not suggest ways that such responses can be reduced.

There are two basic ways that experimental investigations have sought to demonstrate that social support can reduce reactivity. One approach compares the cardiovascular responses of people exposed to a stressor when they are alone, compared to when another person, often a friend, is present. The second approach examines the effect of having another person who is present either provide or withhold support. Some experiments combine both types of manipulations, and compare the effects of receiving supportive feedback from another person during a stressful task, of receiving non-supportive feedback, or of being alone when exposed to the stressor.

One of the earliest social support experiments examined cardiovascular reactivity during two cognitive tasks [17]. Half the subjects completed the tasks without social support, and half brought a friend to the laboratory who sat next to them during the task and touched them lightly on the wrist. This approach tests the "need for affiliation" aspect of social support rather than the social comparison aspect. Every effort was made to minimize the information that could be provided by the friend: she listened to white noise over headphones, and worked on a separate task while offering the support. The results showed that there was significant dampening of cardiovascular responses when the friend was present.

One of the other early experiments took the other approach, examining the effect of having one's opinions supported or not supported by another person, rather than the comfort that is provided by the simple presence of a friend. Gerin et al. [10] arranged for experimental subjects to participate in a debate that included three other people, who were all experimental confederates. The topic was quite controversial (a woman's right to have an abortion), and in all cases two of the confederates vigorously attacked the subject's statements. The manipulation of social support resided in the behavior of the third confederate. In the "no support" condition the third confederate remained silent. In this condition, the average subject's systolic blood pressure increased more than 34 mm Hg. In the "social support" condition, the third confederate indicated at the outset that she agreed with the opinion of the subject, but then did not participate much in the debate. Subjects in this condition displayed a systolic blood pressure increase, on average, of only about 14 mm Hg — less than half that found in the "no support" condition.

The Gerin et al. experiment demonstrates the power of having somebody, even a stranger, agree with one's view of the world. It also fits neatly with the social comparison view of the importance of the immediate context in determining a person's emotional state. In the debate, almost every subject argued the "pro-choice" position. The study was run at a small, liberal, women's college in the North-East, and, although they were not asked, the subjects were almost certainly aware that the pro-choice position was held by most of the students on campus. When confronted by the "pro-life" confederates, they could have found comfort in the thought that just outside the doors of the laboratory were dozens of people who would agree with their view of this issue. They could also have derived all the comfort they needed from the thought that their room-mates and friends were very likely to agree with them. However, in addition to whatever comfort thoughts of such "abstract" support could provide, the presence of a single stranger who happened to be in the same room had a tremendous impact on the subjects' cardiovascular responses. We will return later to the implications of this profound effect of the immediate context on buffering stress reactivity.

Several experiments have replicated the basic social support effect [16, 23], although not all have done so [34, 35]. Some work has focused on the conditions that increase or mitigate the impact of social support. For example, Christenfeld et al. [4] found that the approval
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of a stranger during a stressful speech lowered reactivity compared to when that stranger remained neutral. However, exactly the same supportive behaviors, when they came from a friend of the subject, buffer reactivity to a greater extent. This finding is also consistent with the social comparison theory, which suggests that we care more about comparison with people who are similar to us. A friend should be more similar than a stranger, and so the friend’s nods and smiles of approval should be more meaningful.

Other work has shown that social support does not simply reduce cardiovascular levels, but instead operates by buffering responses to stress. For example, Gerin et al. [9] found that under conditions of low stress, the availability of social support made no difference in blood pressure or heart rate responses. However, under condition of high stress, that same support significantly attenuated the cardiovascular response. Another extension of the social support and reactivity paradigm has been to examine the role of individual differences in the magnitude of the effect. For example, Lepore [22] found that subjects with high scores on cynical hostility tend not to benefit from social support, while those with low scores do.

Another individual-difference extension of the social support work builds on the epidemiologic gender differences in the efficacy of social support. In the marriage and bereavement literature, as noted earlier, men’s health seems much more influenced by the presence of a spouse than does women’s health. A recent social support experiment addressed sex differences directly, examining the effect of the sex of both the person under stress and the person offering support [13]. The results indicated that support from a man, compared to non-support from a man, did not reduce reactivity in either men or women. However, support from a woman was effective in buffering stress responses in both sexes. This finding agrees with the epidemiologic evidence, and suggests that men benefit from marriage, and suffer from bereavement, because the support they gain or lose is the beneficial support of a woman.

The bulk of the experimental work on social support has examined the effects of having a supportive person in the same room as the person under stress. The Gerin et al. [10] experiment, in particular, showed the power of those immediately present to create the social reality. The notion that the immediate context represents a powerful determinant of one’s emotional and physiological state has a number of significant implications. One is that people with greater social support in their regular lives should not show much reduced reactivity to tasks undertaken in the laboratory, when their supportive network is not immediately present. There are some studies which have examined the link between real-world social support and laboratory reactivity, and these have generally indicated little or no effects [e.g., 3].

Another implication of the notion that the impact of a social network is much greater when it is physically present concerns the real-world “generalizability” of social support findings. For many of the stressors that people face, the social network is unlikely to be present. People may have loving families, and many friends on the softball team, but those people will not be with them in the car when they are cut-off on the highway, or with them in the boss’s office when they are fired. Why, then, should it be that epidemiologic studies still find that social networks are helpful? One possibility is that people with large, supportive networks will show some slight benefit during these stressors, even though their support is not immediately present. Presumably, then, the benefits could be even greater if the friends could be in the car or the boss’s office.

The other possibility, and the one that seems more likely, is that the benefits of social support can be realized not only during the period of exposure to the stressor, but after the stressor has ended as well. There is evidence that cardiovascular activation can linger long after a stressor has ended, especially when the stressor involves anger, or some other emotional response [6, 12]. In addition, a sizable emotional and cardiovascular response can be recreated long after the actual event by vividly recalling that event [1]. There is some recent interest in the role that delayed recovery might play in the etiology of cardiovascular disease [24, 36]. A focus on cardiovascular recovery and rumination-induced reactivity is likely to be fruitful because many stressors are themselves quite brief. For example, highway incidents and hostile encounters often last just seconds. However, if the effects linger, any possible damage to the cardiovascular system may well result much more from the sustained post-stress blood pressure elevations than from the short-lived acute blood pressure response. It may well be, then, that it is not the blunting effect of social support on the acute cardiovascular responses during the stressor that reduces the risk of future heart disease. Instead, the benefits of social support may lie in reducing the sustained post-stress effects, which may last for hours, days, or even far longer.

A person who is well-integrated into his or her social milieu may, when exposed to life stressors, show the same cardiovascular response as a loner. However, that response may be of shorter duration if that person can go home and receive support from friends and family.
Social support following stressful events could work in several ways. It could be that simply being with other people damps the stress response. Alternatively, it is possible that a supportive person would provide comfort by confirming ones view of the world as reasonable and justified. Finally, it could be that the most effective social support people provide is through distraction. Socially isolated people may spend more time ruminating about negative events, while those with friends turn their minds to other things. We suggest that it is worthwhile turning experimental attention to social support that may occur after the actual stressor has ended.

In general, the experimental work on social support and cardiovascular reactivity helps fill the gaps left by the epidemiologic, psychological, and physiological data. Reducing cardiovascular reactivity to stressful events may be one way that friends promote health and prolong life. We are just starting to understand the circumstances under which social support will buffer cardiovascular responses, what sort of people are most capable of providing and receiving support, and how long after a stressor such support is most effective.

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