Cognitive distancing, cognitive restructuring, and cardiovascular recovery from stress

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Abstract

Research suggests that phasic changes in cardiovascular reactivity can increase the risk of heart disease, yet much of this research has focused on the magnitude rather than the duration of reactivity. In recent years, studies have confirmed that recovery time is also a significant predictor of future heart cardiovascular disorders. Here we review these studies, as well as the cognitions and behaviors that have been found to influence recovery. We suggest that a useful distinction is that some utilize cognitive distancing, while others seem to be based on cognitive restructuring. These different approaches have implications for the immediacy and permanence of the recovery effects. Finally, we outline the questions that have yet to be answered about recovery and how it could influence long-term health.

1. Overview

Recent research on stress and cardiovascular disease has corroborated the popular belief that stress contributes to heart disease. While the development of heart disease is partially influenced by long-term, tonic conditions such as hypertension, it appears that acute, phasic increases in cardiovascular reactivity (CVR), such as those experienced during stress, can also contribute to cardiovascular disorders. There is another factor that has been found to significantly influence the effects of these phasic increases on long-term health—namely, the time it takes to return to baseline cardiovascular levels. This factor has often taken a backseat in the literature to the magnitude of initial reactivity, yet it has become clear in recent years that recovery time is a significant influencing factor for cardiovascular health, with numerous studies demonstrating the importance of this phenomenon to long-term health. There is also growing evidence on the psychological factors that can influence recovery time, and the activities that can expedite or impede return to baseline following stressors. Such factors, it is proposed here, can often meaningfully be divided into those that reduce attention paid to the past stressor—what we will call cognitive distancing— or those that promote some resolution or change in the way the stressor is regarded—what we will call cognitive restructuring. We will consider the utility and implications of such a distinction.

2. Reactivity vs. recovery

Studies have suggested that the magnitude of reactivity can predict cardiovascular disease. In both human and animal models, individuals displaying the greatest CVR when exposed to stressors have been found to be those with greatest progression of heart disease such as atherosclerosis (Kamarck et al., 1997; Manuck et al., 1983). These studies also show that reactivity is a risk factor independent of baseline heart rate and blood pressure levels; that is, it is not simply the case that those with high reactivity are also those with initially high blood pressure. Rather, even in the face of relatively normal resting cardiovascular parameters, pronounced reactivity in response to threat can, apparently, damage the system. This has lead numerous researchers to focus on reactivity and the factors that can exacerbate or buffer it, including personality traits such as hostility (Smith and Brown, 1991), and social events such as evaluation (Smith et al., 1997) and support (Kamarck et al., 1990).

While the work on reactivity is clearly important, McEwen (1997) has postulated that it may not necessarily be reactivity alone that decides how stress affects the heart, but rather the “total area under the curve” is critically important. That is, if blood pressure (BP) and heart rate (HR) levels were mapped across time, it would not only be the height of the reactivity above normal that played an important role, but the total area above normal levels. This theory emphasizes two potentially distinct dimensions: reactivity height, and the duration elevation. According to this theory, it is not merely the factors that affect reactivity that are deserving of attention, but also those that affect how long that reactivity lasts.

In recent years, the role of this second dimension, namely the duration of elevated CVR, has received more attention as cardiovas-
cicular recovery is increasingly recognized as an important aspect of disease etiology. In fact, several studies have found that even recovery
from acute tasks over the course of several minutes can predict cardiovascular health years later. Stewart and France (2001), for
example, found that recovery following stress predicted hypertension
3 years later. Cheng et al. (2003) also showed that, among men with diabetes, those whose heart rate recovery was lowest after
5 min of exercise had double the risk cardiovascular-related mortality
over a 15-year follow-up than those who recovered fastest. This
effect is robust enough that heart rate recovery is now used as a
prognostic indicator for cardiovascular disease.

One difficulty with isolating the predictive value of recovery is
that those taking the longest time to return to baseline are likely
to be those who showed the greatest reactivity. That is, how long
it takes one to come down will be influenced by how far one has gone
up. However, Stewart and France (2001) found the predictive role
of recovery held even when controlling for initial reactivity values.
That is, of those displaying equal reactivity, the ones experiencing
slower recovery were at greater risk for hypertension. Others have
also found that the two values independently predict future heart
health (Triebel et al., 2001), emphasizing that the two measures
are in fact distinct predictors – and lending credence to McEwen’s
assertion that total area, rather than just reactivity height, should
be taken into account. Another study suggested that recovery could
play a role in the heritability of heart disease. Gerin and Pickering
(1995) measured reactivity and recovery to a laboratory stressor in
healthy college students, some of whom had two parents with heart
disease. The researchers found no difference in reactivity between
the groups, but found that those whose parents had heart disease
were slower to recover to baseline. It is possible, then, that parents
and children share not necessarily plaque buildup or stiff arter-
ies, but a tendency to recover slowly, which in turn leads to the
development of heart disease.

Delayed recovery could be a result of poor physical fitness, and
fitness levels, rather than recovery time, could determine future
cardiovascular health. Addressing this possibility, Cole et al. (1999)
assessed heart rate recovery after exercise in subjects who were
then followed for 6 years. The study found that slow recovery was
positively related to all-cause mortality over the course of the study.
Importantly, they also found that this result held even when con-
trolling for physical fitness level, weight, and blood pressure. This
suggests that, even among those who would seem to have good
cardiovascular health, delayed recovery could still threaten future
heart health.

While the previous studies are consistent with there being an
inherent physiological predisposition toward delayed recovery –
that is, it reflects something about the cardiovascular system –
latter studies have found that recovery can also be controlled by
psychological factors. Glynn et al. (2002), for example, have shown
that more emotionally upsetting tasks result in delayed cardio-
vascular recovery regardless of the initial reactivity level. This
and several other studies have also demonstrated that following a
psychological stressor, rumination, or mentally dwelling on and
reliving the experience, can extend cardiovascular reactivity and
delay recovery (Gerin and Pickering, 1995; Neumann et al., 2001).
Brosschot et al. (2006) have labeled this mental extension of stressors “per-
severative cognition,” and posit that this could play a large – and
maybe necessary – role in the development of stress-related dis-
eases, including heart disease.

Psychological influences over recovery from stress, then, may
play a large role in cardiovascular health, and prevention of perse-
verative cognition following stressors could be cardio-protective.
It is not clear, however, exactly which activities and cognitions
following a stressor would be most effective at creating rapid, com-
plete, and lasting recovery. We suggest that there are two general
categories of alternatives: those that focus on restructuring the indi-
vidual from the event, and those that focus on restructuring the individual’s cognitions about the event. That is, following a dis-
tressing incident, one can choose to not think about it at all, or
to think about it in a constructive way. In the following pages,
we review the current research on the effects of both cognitive distancing and cognitive restructuring on cardiovascular recovery
and health and the utility of such a distinction. Most of the studies
reviewed here examine acute recovery from laboratory stressors
rather than the long-term development of heart disease. However,
given the implications of recovery time for future cardiovascular
health, it is possible that the success of each technique in delaying
or expediting recovery could have serious implications for health.

### 3. Cognitive distancing

When attempting not to think about something distressing, the
easiest alternative is likely to think about something else – that is,
to be distracted. Several studies have examined the effects on
blood pressure recovery of presenting participants with distractions following stressful laboratory tasks. In the short run at least,
this appears to expedite recovery. Following a stressful task, those
given a distraction, such as a form to fill out or an article to read,
generally demonstrate faster recovery to baseline than those left
without distractions (Glynn et al., 2002). As the distraction tasks
are designed to be affectively neutral, it is unlikely that the recov-
ery is due to the task itself. Rather, this suggests that these tasks
expedite recovery because they prevent cognitive fixation on the
stressor.

Distractions may be especially helpful for those prone to rumi-
nation. Gerin et al. (2006) asked subjects to participate in a pair of
anger-recall tasks. After one of these they were given dis-
tractions while after the other they were left to sit alone and
think. Subjects also filled out the destructive anger-behavior-verbal rumination (DAB-VR) scale, which measures the degree to which
subjects engage in angry ruminative thoughts. The authors found
that distraction interacted with trait rumination to influence blood
pressure recovery. The subjects with the poorest blood pressure
recovery following anger recall were those scoring highest in angry
trait rumination. However, when given distractions, these subjects
recovered much faster than before, to the extent that they did
not differ from those low in trait rumination. It could be, then,
that external distractions are not as helpful for those whose minds
are naturally prone to wander even after an upsetting experience,
but that for those with a tendency to ruminate on distressing
incidents distractions can be a key to recovering mentally and
physically.

The cognitive distancing approach does, however, beg the ques-
tion of whether distraction is likely to be beneficial in the long run.
The studies show that distraction may expedite return to baseline
in the minutes following an acute stressor, but it is possible that dis-
traction delays, rather than eliminates, perseverative cognitive and
the resulting elevated blood pressure. Results from some of the pre-
vious studies suggest distraction may have beneficial effects that
persist at least somewhat beyond its temporal boundaries. Those
subjects provided with distractors immediately following the lab-
oratory stressor reported fewer troubled, ruminating subjects in
the period following the distraction (Gerin et al., 2006). A recent
study by Glynn et al. (2007), however, showed that subjects who
were not allowed to ruminate on a stressful task directly after it
occurred still showed significant increases in blood pressure when
they thought about it a week later. Those who had been allowed
to ruminate directly after the task, however, did not show a significant
increase when they thought about it a second time the following
week, suggesting that mentally processing the experience could
actually confer long-term benefits. The benefits of cognitive dis-
tancing, then – or at least the prevention of cognitive fixation –

seem at this point to be short-term, and it is possible that some resolution or restructuring could be efficacious.

4. Cognitive restructuring

The type of cognitive restructuring that is available will depend to a great extent on the nature of the stressor that occurred. In the case of an interpersonal offense, one likely appropriate and productive restructuring would be forgiveness. Such a process can include reevaluating the motives of the offender and considering the offender’s circumstances. Research on forgiveness and health has generally indicated that forgiveness, or at least having a forgiving personality, is associated with better health (Berry and Christenfeld, 1992), and improve chronic conditions such as asthma and arthritis (Smythe et al., 1999). The majority of these effects are long-term rather than acute effects, being measured months after the initial study.

Relatively few studies have examined the acute effects of writing on physiology in the lab, though the studies that have done so generally indicate that writing about traumas actually increases physiological activity (Hughes et al., 1994; Pennebaker et al., 1987). Additionally, most subjects report feeling increased distress while writing about such experiences. These findings suggest that writing itself does not necessarily improve health, but rather the process of writing leads to later benefits after the initial discomfort.

It has been suggested that these benefits may stem from a cognitive restructuring of one’s views of the trauma, and that writing about it aids one in fitting it into a constructive, meaningful narrative. This is supported by the finding that those who use words associated with cause and insight receive the greatest health benefits from writing (Pennebaker et al., 1997). The findings again suggest that it is activities that prevent long-term carryover rather than the response in the face of the threat that can improve health. The importance of recovery is emphasized by the fact that this activity actually increases reactivity while subjects were writing about past emotional traumas, yet still seems to confer marked benefits compared to those who did not engage in emotional writing.

One recent study directly investigated the cognitive mechanisms involved in traumatic writing by assigning subjects particular goals when writing about past traumas, such as finding benefits in the experience or re-experiencing the sensations involved (Guastella and Dadds, 2006). They found that of all subjects, those best able to neutralize the physical and mental distress associated with the incident were those assigned to seek new ways to alter their thinking about the incident (“devaluation condition”). The results from this study highlight the benefits of restructuring specifically, and show that it is not necessarily revisiting the experience that confers benefits but the ability to relive it in a new way.

Cognitive restructuring is at the center of cognitive-behavioral therapy (CBT), which can be used to address depression and anxiety but lately has also been used to address physical diseases, including cardiovascular disease. The use of CBT in treating patients with comorbid heart disease and depression has shown mixed results. The enhancing recovery in coronary heart disease patients (ENRICH) study focused on using CBT and cognitive restructuring to address psychiatric disorders in patients with CVD, and found that in the short run the intervention improved mood and also some cardiovascular symptoms (Berkman et al., 2003). However, the intervention did not appear to have lasting effects on mortality (Berkman et al., 2003). It could be that cognitive restructuring helps in the short-term, but is not sufficient to effect mortality in patients who have already developed heart disease.

5. The dilemma of anger expression

While research has indicated that hostility and anger are bad for the heart (Chida and Steptoe, 2009; Williams et al., 1980), there are no clear findings on just what should be done about it. That is, it remains unclear whether it is better for health to express or “vent” anger, or to keep it in. These expression styles have been labeled “anger-out” and “anger-in,” and have been the center of a good deal of research investigating anger and health. Relatively little is known, however, about how the anger expression will influence physiological recovery from anger.

In some of the earliest studies on anger and CVR, Hokanson examined the effects of retaliation on physiological recovery. Participants in these studies typically engaged in a highly frustrating task with a rude experimenter, after which they were given
some way to retaliate, either physically (by administering electric shocks) or verbally (rating the experimenter’s abilities). Generally these studies indicate that expressing anger verbally or physically after an arousing, frustrating task reduces cardiovascular reactivity (Hokanson and Burgess, 1962; Hokanson and Shetler, 1961). Moreover, actual retaliation against an aggressor reduced CVR more than imagined retaliation, and retaliating against the actual offender expedited recovery more than did administering shocks to someone else. There seems to be something unique, then, about performing real acts of retaliation against actual offenders that offers benefits beyond simply performing the action or thinking about retaliatory actions.

This is consistent with the finding that anger-in emotional styles impair health, with, it seems, a particular impact on cardiovascular health (Dembroski et al., 1985). However, studies have also shown that a compulsive anger-out emotional style is associated with coronary heart disease (Siegman et al., 2000). Furthermore, increases in both anger-in and anger-out emotional styles are associated with increased risk for hypertension (Eversen et al., 1996). Neither type of expression, then, has been found to be significantly better than the other; rather, fixating on one type of anger coping, regardless of the type, appears to be damaging.

Other studies have shown that not all anger expressions are the same, and that the purpose of venting could determine its influence on health. The constructive anger-behavior-verbal scale (CAB-V) measures the degree to which individuals express anger simply to inform the other party that they are angry, or whether they express it for constructive purposes, such as seeking to understand the other party’s point of view or finding new ways to deal with the situation (Davidson et al., 2000). Those high in constructive anger expression were found to have lower resting blood pressure, even after controlling for risk factors for hypertension. Additionally, an intervention study with high hostile males with CHD found that those showing decreases in hostility over time showed increases in constructive anger expression, which in turn predicted lower resting blood pressure (Davidson et al., 1999). These findings suggest that a cognitive restructuring approach following anger may be the best way to recover, though laboratory studies are clearly needed to investigate this possibility.

6. Other factors in cardiovascular recovery

While many activities found to influence cardiovascular recovery fall into the categories of cognitive distancing and cognitive restructuring, there are some that do not easily fit into either. It is not necessarily the case that there is a third mechanism, however; the way that these factors work remains somewhat mysterious. Exercise, for example, has been found to affect recovery. This is perhaps not surprising, as stress is primarily a physiological response meant to facilitate action. Following a mental arithmetic task with harassment in the lab, participants in one study were assigned to exercise while others sat still (Chafin et al., 2008). While reactivity was initially greater in those who exercised, they returned to baseline following exercise sooner than those who did nothing. It is possible that part of the value of exercise lies in its potential role as a distractor, yet an additional distraction-matched control group did not recover as quickly, suggesting there is something particular about the physical act of exercising.

Given the physical nature of the stress response and the tasks it presumably evolved to address, it is possible that a stressful task does not feel fully mastered until there has been some physical response to the threat. The fact that those who exercised experienced greater reactivity (during the exercise portion) yet still returned to baseline fastest emphasizes the dramatic role physical activity can play in recovery. Whether this works by changing whether people feel they have responded to the stressor appropriately, changing the extent to which they continue to think about it, or through some other process is not yet known.

Music has also been found to affect recovery. While distraction could again be pointed to as a possible mechanism, not all types of music have proven effective. Participants in one study listened to jazz, pop, or classical music following a laboratory stressor (Chafin et al., 2004). Those who listened to classical music recovered significantly faster than those who did not listen to music, while those listening to the other styles showed no difference in recovery from controls. One could speculate that the classical piece would not likely be the most distracting of the three, for an undergraduate population, and thus it is likely that another mechanism is responsible for the expedited recovery. It is not clear, however, that music will restructure the way that people think about the prior, stressful task in any explicit manner. It is possible that music sets an affective tone that can influence the mood of the subject, which in turn influences physiological responses. That is, it could work through some indirect mechanism, with classical conditioning influencing mood, which could then affect the way people regard the prior task. The sorts of probes that would provide evidence about any such mechanism, however, have not been tried.

7. The importance of flexibility

Many of the factors reviewed here found to enhance recovery seem tied together by a common theme: specifically, cognitive flexibility. As reactivity and recovery can be influenced by cognitive factors, it is not surprising that being able to alter physiology relies partially on being able to alter cognitions, such as they way one views an offender or a traumatic event. When analyzing writing styles in subjects from several past traumatic writing studies, Campbell and Pennebaker (2003) found that those with a flexible writing style that changed from day to day were those receiving the most health benefits. This was not the case for those writing about superficial topics, however, which emphasizes that flexibility in framing and processing stressors in particular is important for health.

The role of general flexibility in health has recently received increased attention, and could be a significant predictor of psychological and physical well being (Rozanski and Kubizansky, 2005). The incidence of cardiovascular disease is especially high among those with psychiatric disorders such as depression and anxiety, which could partially be explained by the cognitive inflexibility that marks such disorders (Larsen and Christenfeld, 2009). Additionally, a flexible coping approach that shifts from one coping style to another has been found to be more beneficial for health than any one style in particular (Folkman and Lazarus, 1980).

Both strategies discussed here – cognitive distancing and restructuring – rely on an ability to shift thought patterns away from destructive rumination, either by shifting one’s focus entirely or shifting one’s point of view. As discussed previously, it is unclear whether distancing does in fact confer any sort of long-term benefits. It is clear, however, that unchanging fixation on a stressor can have both short- and long-term ramifications.

8. Conclusions

Given the importance of cardiovascular recovery in health outcomes, a more thorough understanding of the factors that can aid and impede it is paramount. It seems clear that being able to discontinue angry rumination is essential, yet it is not entirely clear what traits or situations give rise to this flexibility. One possibility is that recovery relies on a sense of completion. That is, it is possible that recovery is delayed until we engage in behaviors that confirm the event has been dealt with. The retaliatory actions offered...
to some of the subjects in the Hokanson studies could have acted as such markers. Exercise could also, as discussed earlier, suggest the completion of a threatening encounter, as the stress response primarily facilitates physical action. It is possible that the recovery process does not really begin until the threat has demonstrably been overcome. Research shows that we are more likely to remember tasks that have not been completed, a phenomenon known as the Zeigarnik effect (Zeigarnik, 1927). Lewin (1927) has suggested that this enhanced memory is mostly a product of the tension created by leaving a task incomplete. It is likely, then, that stressors in particular would continue to produce tension until fully addressed and completed. This may be why distractions produce some alleviation in the short-term, but that, without some sort of cognitive restructuring, they do not offer lasting resolution of stress.

Clearly many of these questions cannot be answered without more targeted research. It is unclear whether the benefits of cognitive flexibility come solely from restructuring the way one thinks about a stressor, or if being able to shift the topic of one’s thinking—that is, distracting oneself—confers the same benefits. Also, while a forgiving personality has been linked to better health, it is not entirely clear how this occurs. To date, no studies have examined actual offense and forgiveness in the lab to assess their effects on cardiovascular parameters. Further investigation of activities such as exercise and music could further illuminate how these aid recovery, and speak to whether they primarily influence mood through endorphins or other physiological mechanisms or whether they also influence cognitions.

Furthermore, it remains unclear exactly what processes are involved in forgiveness. It could be that to be effective, forgiveness requires that one shift attribution from malicious intent to a product of circumstance, and this cognitive restructuring enables recovery and aids in feelings of completion. It could also be that forgiveness instead requires the ability simply to move on, and no longer dwell on the offense, and this cognitive distancing facilitates recovery. Investigating these possibilities could shed light not only on what constitutes forgiveness, but also the factors that are most important in recovery.

Generating physiological responses to external threats is clearly an adaptive response. Research on the role of recovery in disease etiology, however, emphasizes that the stress response is not the only important adaptation we make in response to a threat. Just as important as changing our physiology to cope with, or even survive, the threat is the ability to assess when a threat is no longer present, and be able to return to baseline functioning. Without this accompanying shift, the ability to interpret and respond to a threat can become more damaging than protective. The importance of recovery is further magnified by the fact that many modern threats are of a diffuse, vague, social nature, without a clear stopping point. This makes the processes and effects of cognitive distancing and restructuring especially important in long-term cardiovascular responses, and consequently the development of cardiovascular disease.

References


