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Hypothesis

Cardiovascular Disease and Psychiatric Comorbidity: The Potential Role of Perse Cognition

Britta A. Larsen and Nicholas J. S. Christenfeld

Department of Psychology, University of California, San Diego, 950 Jolla, CA 92093-0109, USA

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Abstract

The high comorbidity between psychiatric disorders and cardiovas little is known about the processes linking the two. One plausible with psychiatric disorders to ruminate on stressful events. Th cognition, can extend the psychological and physiological effects disease etiology. In this paper, we discuss the potential role of pe between psychiatric illness and cardiovascular disease. Ruminat stress, which in turn has been found to predict future cardiovas mechanism in the longitudinal link between worry and cardi characterizes mood and anxiety disorders may then contribute t instead through extending activation, increasing the risks for cardi

1. Introduction

The high comorbidity between psychiatric disorders and cardiovas in recent scientific literature [1 – 6]. Mood and anxiety disorders ir

research showing that those displaying symptoms of anxiety or related morbidity and mortality [2, 7]. Those with the highest leve in risk for fatal coronary heart disease [7], and those with clinica risk for cardiac incidents even as much as ten years following the is a link between these disorders, the connection itself is not well u

One explanation for this comorbidity is that chronic disease, such restriction of activities, fear of impending mortality, and other depressive symptoms have also been found to predict coronary he cardiac symptoms (see [9]), suggesting a possible bidirectiona behavioral link, as behaviors associated with development of CVD isolation, are also associated with mood and anxiety disorders [4] well demonstrated, and in many cases can explain their cooccu connections persist even when controlling for these important heal further underlying traits or behaviors common to mood and anxi mechanisms in the development of CVD.

Another significant risk factor for CVD is psychological stress (se morbidity and all-cause mortality [10] and is recognized as a ris cardiovascular diseases [11]. During acute stress, a number of heart rate and blood pressure. According to the reactivity hypo response over time can result in weakened arteries, plaque build those experiencing stress more frequently or to a greater deg myocardial infarction, and other cardiovascular disorders.

While the majority of stress literature has focused on the magr duration of reactivity is also important. McEwen [13] has suggeste area under the curve" in which cardiovascular levels are elevat elevation that lingers after stress has passed, is more influential in the acute cardiovascular response. Consequently, it is import cardiovascular parameters are elevated above baseline, but the a [14, 15].

The inability to return quickly to baseline following elevated cardio risk factor for cardiovascular disease. From this perspective, th generalized anxiety disorder (GAD) [16] could help to explain thei found to exhibit lower heart rate variability (HRV), suggesting lo parasympathetic nervous system [16]. This inflexibility could prev to future disease.

Another way of thinking about inflexibility is not in physiological te being able to return to physiological baseline, it is also important baseline—that is, to no longer experience the cognitive or affectiv the field, such as life event scales, measure the duration of object of an individual's subjective affective and physiological experi experience of stress strictly coincides with the occurrence of a st autonomic inflexibility can prevent recovery from arousal, psy stressors into long subjective ones. Consequently, the duration of the duration of one's cognitive and affective response to it.

Such an approach suggests a mechanism through which the s boundaries of a stressful event, namely, prolonged cognitive activa anticipation. Brosschot et al. [17] have labeled this extended co

have suggested that the resulting extended duration of physiologi
be necessary for—the development of serious health consec
psychological stress.

This explanation is particularly attractive when exploring cardio
disorders, since conditions such as GAD, depression, and Obsess
inability to shift attention away from troubling thoughts. This is
stressor after it has ended, and anxiety, which can induce stress
ability to shift focus in a timely manner and adapt to circumstance
so not only marks psychiatric disorder, but also contributes to phys
the hallmark of these psychiatric disorders could also be respon
reactivity surrounding stressors (or, in the absence of concret
deleterious for cardiovascular health.

In the pages that follow, we discuss studies that examine the conc
mood disorders and as a precursor to cardiovascular disease. (Son
while others use "rumination"; in this paper the two will be use
found connections between rumination and long-term health cons
role of perseverative cognition in delayed recovery following a
cognition as a possible mechanism in the link between psychiatric

2. Perseverative Cognition and Psychopathology

As described above, those with anxiety disorders have been found
disorders, as well as many other psychopathologies such as de
inflexibility; specifically, those with anxiety and depression are p
focus away from them.

Research has shown that perseverative cognition is not only a syn
it. Nolen-Hoeksema, found that trait rumination, measured using a
negative emotion, predicted future episodes of depression and anx
while women are at greater overall risk for depression, studies sh
trait rumination [19]. Consistent with this, laboratory studies sh
participants. Compared to nondepressed controls, depressed par
depressed when assigned to ruminate on a stressful incident, w
showed significant increases in positive mood [20]. Furthermore,
episodes [21], and learning to not ruminate appears to prevent de

Another recent study found that cognitive inflexibility may be
associated with psychopathology, particularly depression, and anxi
surgery (similar incisions were made and repaired, but no actual
subjected to serotonin depletion in the prefrontal cortex showed
reversed, and showed continued fixation on the previous parad
impede their ability to learn a new task, suggesting that this deple
rather depleted their ability to shift focus and change their paradig
of the psychological disorders characterized by serotonin dysregula

3. Rumination and Long-Term Health

Several prospective studies have examined the connection bet
health, generally finding evidence of a positive link between them.
worry across five domains (social conditions, health, finances, self-

heart conditions and followed them for 20 years. They found that t
an approximately 50% increased risk for total coronary heart di
remained highly significant when accounting for possible confoun
over financial and health matters leads to elevated risk for total CH

It is possible that worry could be a result of rather than a cause o
of worry in the relationship is supported by the fact that this link
than worry about health conditions. If worry were only the result c
as cardiovascular disease, one would expect the strongest relati
worry over health conditions. This, however, was not the case
perseverative cognition in cardiovascular health, as social conditi
lead to extended worry or rumination. While financial and healtl
endpoints (such as paying off a debt or reducing one' s blood pr
indicators that the trouble has passed. It may be unclear, for ex
resolved, making those involved particularly prone to rumination a
that worry can predict future health outcomes, they do not speak
that was the critical aspect in producing these health problems.

4. Rumination and Recovery from Psychological Str

The effects of worry and rumination on recovery from stress h
studies. Generally, these have found that worry and rumination
findings at least suggest a possible explanation for the relat
cardiovascular reactivity has measured responses from both the s
Roughly speaking, sympathetic response, typically measured with
increased physiological arousal, while parasympathetic response,
the body to baseline levels following sympathetic reactivity.

As mentioned previously, several studies have examined stress
anxiety disorders [16]. The majority of these have assessed paras
rate variability (HRV), which has been found to predict cardiovasc
of these studies have found that those with clinical anxiety sympto
variability following stressors [16, 27, 28], suggesting a delayed
that those with anxiety are prone to slower cardiovascular recover
any cognitive processes. It could be, for example, that lowered va
which then causes an individual to ruminate.

Most laboratory studies with nonclinical populations have analyze
have found that those high in trait rumination and worry, but
psychiatric disorders, exhibit slower heart rate and blood pressu
31]. Results from this line of research are mixed, however [32,
methods of measurement. These studies use many different meas
of them explicitly investigate whether participants engage in rumin
tendency to ruminate are informative, it seems that assessments
stress in the lab could be much more useful. Such measures cou
recovery and speak to the validity of trait rumination measures
include Likert-type scales for statements such as "I keep thinkin
[34], which could easily be validated by assessing whether part
about themselves do in fact continue to think about laboratory stre

Another problem facing these laboratory studies is determining wh
a distinct recovery process, or are due to differences in initial
impeded recovery, this could be a result of these stressors eli

recovery would simply be a function of reactivity rather than a d
possible that those with anxiety and depression experience longe
reactivity during actual stressors.

One key study explored several of the issues stated above by orth
stressful tasks. Glynn et al. [35] monitored cardiovascular reacti
Two stressors (a cold pressor task and a shock-threat task) were
while the other two (mental arithmetic with harassment and physi
reactivity. Additionally, the mental arithmetic and shock threat w
cold pressor and exercise tasks were meant to be predominantly p
function of reactivity magnitude, one would expect the tasks elici
Alternatively, if recovery is an affective and cognitive process rath
the tasks higher in emotionality to result in slower recovery. The
arithmetic with harassment tasks elicited the greatest initial arou
arithmetic and shock threat—that showed delayed recovery, supp
task influenced recovery more than did the initial magnitude of res

In order to investigate further whether this continued activation
second study in which all participants completed a mental arithm
half were told to relax and sit quietly, while the other half were gi
from thinking about the stressor. Again, those who were allowe
elevation of SBP, while those who were distracted recovered quic
these findings, showing that cognitive distraction can expedite
subject to ruminate prevents recovery [29, 31].

These findings underscore several important points. First, they em
processes, and given that they can respond independently, the fo
for the latter. While stressors like the shock threat could be cor
small initial change in CVR, they could be disproportionately delete
are long lasting. Secondly, these findings also highlight the role of
measured in terms of the duration of the actual stressor, but if
actual experience of stress—and resulting physiological reactivity
could be that worrying over social conditions predicted greater risk
these problems were more emotionally upsetting and generated r
inadequate finances. Finally, these findings emphasize that the del
is a cognitive rather than physiological effect. While emotional eve
arousal to nonemotional tasks, recovery from such tasks, such as
cognitive focus.

Other studies have shown that the physiological effects of stress ca
event. While there is a good deal of research on reactivity related
examining the effects of anticipating concrete events. Though th
increased cardiac activation in those anticipating stressors compa
that physiological effects of stress can even be manifest during sle
both that perseverative cognition needs not to be conscious, a
impaired sleep quality [36]. The data connecting anticipation of str
extremely limited.

5. Cardiovascular Recovery and Long-Term Health C

While the allostatic load theory predicts that extended stress activ
leads to long-term negative health, longitudinal studies with hea
Several prospective studies have examined whether recovery fron

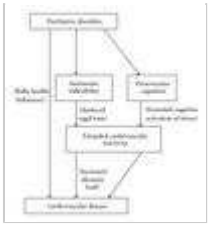
mortality. The results from several of these studies show quite s only several minutes, can predict health years later. Two of these recover from acute cardiovascular reactivity were more likely to de Stewart and France found that this effect held even when contr recovery and reactivity are distinct risk factors. Treiber et al. [following a stressor independently predicted heart rate and blood values. Another laboratory study investigated the role of reactivit parents either did or did not have heart disease [40]. The authors groups, but found that those who had two parents with heart dise suggests that delayed recovery may act as a mechanism in the he inherit "heart disease" from their parents, but in some cases recovery that eventually lead to cardiovascular disease.

Two other studies also found that slow recovery from acute reactiv mortality five and six years later (see [41, 42], resp.). Of cours perseverative cognition; cardiovascular reactivity was due to phys there are myriad health-related factors, such as physical fitness, independently. Importantly, however, the Cole et al. study fou controlling for initial health status, including weight, blood pressur health. This suggests that delayed recovery, whether due to ph consequences independent of other cardiovascular risk factors.

While these studies suggest a connection between recovery and he additional research. Specifically, prospective studies are needed to from psychological stressors, particularly due to rumination, can whether rumination can lead to heart disease in otherwise phys predisposition is also needed for disease to develop. Such studi cognition contributes to physical disease, which would likely be in physiological flexibility—that is, normal sympathetic and paras cognition, and by doing so extend sympathetic responses, dec cardiovascular system. In this case, perseverative cognition would that certain people experience autonomic inflexibility due purely The resulting extended activation could both trigger cognitive fi cardiovascular system. Perseverative cognition in this model coul would serve more as a marker than a cause of future disease. elucidate which individual differences act as risks for heart disease

Figure 1 shows a simplified view of the comorbidity relationship. C interconnected than shown, but the figure is designed for illust established behavioral link mentioned previously. The central connection, in which psychopathology is associated with deficiencie elevated cardiovascular reactivity following stress. The focus of th right, which illustrates a cognitive pathway linking these phenome physiological deficit, but rather to cognitive fixation on negative e means mutually exclusive; rather, it is likely that all three (plus ad between psychopathology and cardiovascular disease.

Figure 1: This informal theoretical model sho linking psychiatric disorders and cardiovascu mechanisms have been highlighted (the left a additional cognitive pathway on the right, in v cognitive fixation on stressful experiences.



6. The Role of Flexibility in Health

The studies discussed above emphasize an often overlooked indivi
As the ability to adapt is an essential aspect of survival, the impor
With much attention devoted to the duration of actual stressors, it
most deleterious for health. These presumably result in the lon
negative consequences. However, the effects of a chronic stresso
regulate negative emotions, adjust appraisals of threat, and alter
those with inflexible coping responses could experience negative a
from even brief stressors. In fact, it has been suggested that copi
strategies, predicts effective coping responses to stress better tha
Lazarus [44] emphasized that coping is a shifting process and foun
fluctuated markedly not only between but also within individuals.

While the research on flexibility's impact on health is limited, th
mental and physical health (see [45]). One laboratory study found
freshmen predicted lower levels of distress 1.5 years later [46]. F
social support confers health benefits [47]. It is possible that sup
different appraisals, or act as distractions to prevent rumination.

Flexibility may also be a common theme in various coping strate
The Constructive Anger Behavior-Verbal scale (CAB-V), for exam
anger verbally in order to understand "the other person's poir
perceiving and dealing with the anger situation" [48]. As oppos
someone that they were angry, those high in constructive anger
when controlling for hypertension risk factors and psychosocial
order to organize and understand them has also been found to in
could be partially due to the writing process offering new interpr
cognitive behavioral therapy (CBT), which focuses on cognitive r
shown to be an effective treatment for depression and anxiety. Fu
Enhancing Recovery in Coronary Heart Disease Patients (ENRIC
restructuring specifically to address depression and anxiety in patie
have found that CBT can effectively address psychopathology in th
improved cardiac health [52].

While these studies do not examine flexibility specifically, they do s
understanding and embracing new perspectives, which could both
associated with better health.

7. Conclusions

As shown in the studies above, inflexibility, whether cognitive,
mental and physical health. It is possible that the high comorbid

disorders is attributable to a general state of inflexibility, leading variability and vagal tone, and extended sympathetic arousal. Add these areas perpetuates it in another. Perseverative cognition, for physiological arousal [35], and extended and/or more severe depr

While the studies discussed here suggest a role of perseverati cardiovascular disease, clearly there are questions remaining to b recovery from stress, a condition which predicts future cardiovas long-term health outcomes can in fact be predicted by differences evidence of an autonomic inflexibility in those with GAD, it is unce shift cognitions to more constructive paths, might also play a role.

As perseverative cognition has been found to extend physiologic health, a better understanding of the situational and individual fa important. Generally, cognitive fixation suggests a lack of adapt physical and social world.

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