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Anger and the Heart: Perspectives on Cardiac Risk, Mechanisms and Interventions

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ABSTRACT

In the popular imagination, anger has long been linked to cardiovascular diseases (CVD), but empirical validation from case–control and prospective studies emerged only in the 1970's. After describing the multidimensional nature of anger and its assessment (via self-report or observed in structured interviews), this paper selectively reviews evidence in (a) behavioral epidemiology, (b) stress and biological processes with implications for cardiopathogenesis, and (c) behavioral/pharmacological interventions for anger/hostility reduction. Although evidence is inconsistent, chronic feelings of anger, cynical distrust and antagonistic behavior are at least modestly associated with risk of both initiation and progression of CVD. Anger/hostility also is linked to stress exposure and reactivity, exaggerated autonomic function, reduced heart rate variability, platelet aggregation and inflammation. Clinical and pharmacologic treatment of anger/hostility has the potential to reduce anger and its health-damaging effects. Limitations, including third-variable explanations and overlap among the negative emotions, and implications for cardiology and behavioral medicine research and practice are discussed.

In the popular mind, of all of the negative emotions, anger seems to be most strongly linked with cardiac disease. A famous 18th century surgeon claimed his life was "at the mercy of any scoundrel who chooses to annoy me." It was no exaggeration as he died of a heart attack shortly after an argument.[1] The connection between anger and cardiac illness has received some empirical validation. A case-crossover analysis of approximately 2000 patients admitted for a myocardial infarction (MI) indicated that experiencing anger in response to provocation increased the risk of MI more than two-fold in the 2-h following the provocation.[2] In the last three decades, epidemiologists, behavioral medicine researchers and interventionists have studied the role of anger and related emotions in cardiovascular disease.[3,4] The aim of this paper is to provide a selective review of empirical highlights, implications and unresolved issues in this area.

Historical perspective

Two developments made anger a salient factor for behavioral medicine researchers and practitioners. In its early history, psychosomatic medicine, which was strongly rooted in the psychoanalytic framework, held that psychic conflicts can instigate adverse physiological effects leading to physical ailments, such as asthma and gastric ulcers. One of their most popular theses – based originally on case studies – was that persons with a history of repressing or suppressing

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Abbreviations and Acronyms

CAD = coronary artery disease

CBT = cognitive behavior therapy

CHD = coronary heart disease

CVD = cardiovascular diseases

ET-1 = endothelin-1

Ho = Cook–Medley Hostility Scale

HRV = heart rate variability

ICD = implantable cardioverter–defibrillator

IHD = ischemic heart disease

MI = myocardial infarction

POH = potential for hostility

SI = structured Interview

anger were at high risk of developing essential hypertension.[5] Although the empirical evidence for this hypothesis is meager,[6] the belief persists perhaps because the idea that keeping in angry feelings is related to "hyper-tension" is intuitively compelling.

In the 1970's, interest in anger as a coronary artery disease (CAD) risk factor grew because of findings linking the Type A behavior pattern, which included impatience, irritation and anger as components (in addition to competitiveness, time urgency and job involvement), to cardiac events.[7,8] Subsequent epidemiological studies found Type A behavior was a weak and inconsistent predictor of CAD,[9,10] but hostility and antagonistic behavioral tendencies – referred to as "Potential for Hostility" (POH) – scored as subcomponents of the Structured Interview (SI) used to assess Type A,[11,12] or with anger–hostility questionnaires predicted cardiac disease.[13,14]

These associations, which persist even after controlling for traditional risk factors, have led to considerable subsequent research on the anger–cardiac disease connection in epidemiological studies, in basic research concerning the effects of anger on physiological processes that are potentially pathogenic and in the testing of clinical behavioral interventions to reduce anger with the aim of lowering cardiac risk.

Definitions and assessment

Anger-related emotions come in many varieties and have different implications for health. A three-factor model, consisting of cognitive, emotional and behavioral dimensions, seems to represent the best conceptual structure for anger.[15] Different forms of anger emotions may have different implications for cardiac health. Also, acute feelings, thoughts and behaviors, which can be considered state manifestations of anger (illustrated by a study mentioned earlier),[2] should be distinguished from the chronic disposition to feel, think and act angrily, the trait manifestation.

The affective dimension, anger, refers to feelings of being treated unjustly and is accompanied by subjective arousal. This personal disposition is assessed with the Spielberger Trait Anger Scale, which measures the frequency and intensity of angry affect.[16] The cognitive dimension is hostility, which is conceptualized as cynical attitudes about others and most commonly assessed with the Cook–Medley Hostility (Ho), derived from the Minnesota Multiphasic Personality Inventory.[17] Certain subscales of the Ho inventory, such as the Cynical distrust scale, have shown stronger associations for predicting CHD.[18]

The behavioral dimension is anger expression, referring to tendencies to be verbally or physically antagonistic. It can be measured by coding antagonistic behaviors in response to the structured interview (SI) originally developed to assess the Type A complex.[12,19,20] There also is a self-report inventory, the Anger-Out scale, to assess tendencies to express aggression outwardly.[21] Another scale, the Anger-In scale, was designed to assess tendencies to suppress or withhold anger.[21] Questions, however, have been raised about the substantial overlap between the general predisposition to experience a frequent and intense range of all types of negative emotions and Anger-In.[22] A third scale, Anger Control has items inquiring about the extent to which an individual "…controls my temper," however this measure has been used infrequently by researchers.[21]

Several other anger and hostility measures, mainly adaptations or extensions of the ones described above, also have been used, but for the most part represent no significant changes. An exception is the anger coding scheme based on distinctions among three kinds of anger expression[23,24]: (1) Constructive anger expression refers to the "…ability to deal directly and assertively with the person with whom (the person) … is angry, discuss … (the reasons for the) upset, and resolve the anger situation…" (p. 201,[23]). (2) Destructive anger justification represents tendencies to express anger for "… self-justification or vindication and attribution of blame elsewhere…" (p. 201,[23]). (3) Destructive anger rumination represents "…the tendency to brood when angry…(so that) … feelings of anger increase over time…" (p. 201,[23]). The presence and intensity of three predispositions are assessed in a 12-min videotaped stress interview asking participants to talk about their characteristic responses to different situations. Trained coders listen to the participant's verbal responses and also observe their interpersonal behavior during the interview.

Correlations among anger measures tend to be low-to-moderate, which may partly reflect the multi-dimensional nature of anger.[15] Unfortunately, even measures purporting to measure the same construct often are poorly correlated. Subjects' reluctance to admit to or exhibit angry thoughts, feelings and behaviors, methodological challenges associated with detecting subtle nonverbal behaviors in observational coding and variability in the rigor of interviewers and coders may be responsible. Finally, self-report questionnaire measures rely on subjects possessing self-insight about negative aspects of their behavior.

Evidence from behavioral epidemiology

Early results, based on subcomponent analyses,[11,12,18,19] showed strong associations between anger/hostility and cardiac events or mortality in prospective studies, often of approximate magnitude to traditional risk factors, but the evidence has been more mixed since then.[25] In a qualitative review,[25] outcomes were assessed separately for samples without known CHD (coronary heart disease) and those with CHD (fatal or non fatal MI). In healthy populations (23 relevant