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The importance of examining blood pressure reactivity and recovery in anger provocation research

Jeremy C. Anderson*, Wolfgang Linden, Martine E. Habra

The University of British Columbia, Canada

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Abstract

Objective: We investigated the moderating relationship of hostility on emotional and physiological arousal due to acute anger provocation; stress reactivity and recovery were measured.
Method: Forty-five participants completed a measure of trait hostility (CMHQ) and performed a mental arithmetic (serial 7s) task while receiving scripted comments at set intervals designed to provoke anger (harassment). The impact of trait hostility (high, medium or low) on arousal and recovery was examined.
Results: Participants low in self-reported hostility showed greater HR reactivity to the task but recovered quickly. Participants high in hostility showed noticeably slower recovery in SBP maintained after task completion.
Conclusions: The findings underscore the importance of examining both reactivity and recovery data in anger provocation research because the apparent influence of trait hostility on cardiovascular functioning would have been missed if recovery had not been systematically studied.

Keywords: Stress; Reactivity; Recovery; Hostility; Blood pressure

Research on stress and CVD has partly focused on how individual personality characteristics interact with stressors such that some people develop illness while others do not. Although many researchers have examined subjective and physiological reactivity to a variety of stressors, much less attention has been given to factors that prevent recovery. The current study examined the influence of trait hostility on cardiovascular functioning both during and after interpersonal conflict. Acute emotional stress is thought to be particularly salient for the development of stress-related disease processes (Linden et al., 1998; Schwartz et al., 2003). The focus here was on cardiovascular stress *recovery* because frequent exposure to challenges that prevent quick recovery are particularly promising candidates for explaining CVD development (Linden et al., 1997; Schwartz et al., 2003). As such, we hoped to demonstrate the importance of examining recovery paradigms in explaining personality–pathophysiology relationships.

Hostility has been conceptualized as a personality trait composed of a combination of affect, attitudes, and general aggressiveness reflecting a propensity for anger (Cook and Medley, 1954). Trait hostility has repeatedly been shown to relate to poorer prognosis for CVD (Barefoot et al., 1989), and has also been shown to relate to elevated SBP and stress reactivity (Smith and Houston, 1987). In addition, numerous studies suggest that cardiovascular reactivity bears some relationship to CVD development. Diagnosed hypertensives show greater cardiovascular reactivity to laboratory stressors than normotensives (Fredrikson et al., 1991; Marrero et al.,

Abbreviations: CVD, cardiovascular disease; BP, blood pressure; HR, heart rate; CMHQ, Cook–Medley Hostility Questionnaire; SBP, systolic blood pressure; DBP, diastolic blood pressure; ERS, emotion rating scale.

* Corresponding author. Psychology/UBC, 2136 West Mall, Vancouver, BC, Canada V6T 1Z4. Tel.: +1 604 408 0711 (Home); +1 604 822 3800 (Lab); fax: +1 604 822 6923.
E-mail address: jcanders@interchange.ubc.ca (J.C. Anderson).

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1997) and normotensive individuals with a positive family history of hypertension show greater reactivity to laboratory stressors than those without family history of hypertension (Light et al., 1999). Evidence from studies such as these has led to the conclusion that chronic cardiovascular *hyper*reactivity may be a marker of, or contributor to, primary hypertension (Treiber et al., 2003; Schwartz et al., 2003).

More recently, interest has turned towards examination of the rate of recovery following a laboratory stressor (Linden et al., 1997; Schwartz et al., 2003). It has been theorized that negative valence emotions such as anger induce greater physiological arousal that is initially adaptive in mobilizing an organism to better deal with an acute stressor but prolonged departure from homeostasis results in exhaustion and impaired functioning. Effective coping is therefore characterized by quick recovery from arousal (McEwen, 1998). Despite these compelling reasons for studying stress recovery in relation to CVD development, relatively few studies have done so (Linden et al., 1997) and there is scant knowledge of the factors that account for slow recovery.

The present study explicitly focused on recovery to better understand personality–stress relationships. To do so, we exposed study participants to emotional stress, operationalized as verbal harassment (a situational manipulation known to elicit anger), while they performed an emotionally neutral stress task (mental arithmetic). We hypothesized that trait hostility would moderate the response to the task (i.e., highly hostile individuals would show a greater magnitude increase in HR and BP) and that high hostility would result in attenuated recovery, because one would expect more highly hostile individuals to remain angry longer. The advantage of this particular protocol was to permit detection of factors affecting reactivity but not recovery and vice versa.

1. Method

1.1. Participants

Participants were 45 (23 male, 22 female) psychology undergraduates between the ages of 17 and 28 (M=19.6 years). Sample ethnicity was: 48% European/Caucasian, 28% Chinese, 13% other Asian, 11% various others. Participants received course credit in exchange for participation.

1.2. Data collection

Participants were classified as high, medium, or low hostility on the basis of their tercile scores on the CMHQ (Cook and Medley, 1954), a standard measure of hostility with good psychometrics (Barefoot et al., 1989). Subjective anger ratings were measured during the study by having participants complete a 7.5 cm visual analogue emotion rating scale form (ERS). Cardiovascular data were collected using a Dinamap 845 Vital Signs Monitor (Critikon, Inc., Tampa, FL), which provides separate measures of SBP, DBP and HR.

1.3. Procedure

One day prior to their participation in the laboratory portion of the study, participants came to the lab to complete a consent form and a package of questionnaires including the CMHQ. Participants were given a tour of the lab and had their BP taken using the same equipment to be used the following day. This visit was expected to reduce reactivity resulting from the novelty of the lab environment. Participants were informed via written instructions that they were to refrain from consuming alcohol and caffeine, smoking, exercising vigorously for 12 h prior to participation in the study, and to eat a light meal at least 1 h prior to their visit. They were also told that the purpose of the study was to assess their physiological reaction to a challenging cognitive task, although they were not told they would be harassed.

1.4. Baseline period

The experiment began by having participants be seated alone in the testing room. A standard occlusion cuff was attached to participants' non-dominant arm and they were instructed not to move their arms while the cuff was inflated. Participants were asked to sit quietly. BP and HR readings were taken at minutes 0, 2, 10, and 12 of the 12-min baseline period. At the end of the rest period, participants were asked to complete an ERS. Following this, the experimenter entered the testing room to provide more detailed task instructions. Participants were instructed that they were to perform serial subtractions of 7, starting at 9000 (i.e., "9000, 8993, 8986, 8979, . . .", etc.), out loud and as fast as possible for several minutes until instructed to stop and that a lab technician would tell them when to start and stop.

1.5. Task period

At the start of the task period, participants were told by the lab technician (a gender-matched confederate) to begin counting backward; the task length was 13 min. A task length of 13 min is unusual but was chosen here because salivary cortisol samples had been collected in a larger study (Anderson et al., 2001) from which the current subset of data were derived. BP and HR readings were taken 5 times at equal intervals. The lab technician provided scripted comments at set intervals (Appendix A), via intercom, with the intent of producing feelings of anger or irritation in participants. At the end of the task period, participants were told to stop counting by the lab technician and to complete a second ERS.