Health-Damaging Personality Traits and Verbal–Autonomic Dissociation: The Role of Self-Control and Environmental Control

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This study tested predictions derived from D. C. Glass’s (1977) uncontrollability model regarding the link between control-related personality attributes and the dissociation of affective and autonomic responses to stress. Pressured drive, measured by the Jenkins Activity Survey (D. S. Krantz, D. C. Glass, & M. L. Snyder, 1974), and emotional defensiveness, measured by the Marlowe–Crowne Social Desirability Scale (D. P. Crowne & D. Marlowe, 1964), were examined in relation to cardiovascular and affective responses to mental arithmetic in 31 male and 26 female college students. Pressured drive was positively associated with cardiovascular reactivity but unrelated to affect ratings. In contrast, emotional defensiveness was unrelated to cardiovascular reactivity, but high scores were associated with smaller increases in self-reported negative affect. The findings suggest that these potentially health-damaging personality attributes may influence stress response measures through independent mechanisms for maintaining environmental control and self-control.

Key words: pressured drive, emotional defensiveness, control, cardiovascular reactivity, performance challenge

Cardiovascular reactivity, defined as behaviorally induced change in cardiac or vascular activity, has received considerable attention as a possible marker for mechanisms linking psychosocial risk factors to cardiovascular disease (Blascovich & Katkin, 1993; Krantz & Manuck, 1984). This research has identified situational determinants (Kamarck, Annunziato, & Amateau, 1995; Tomaka, Blascovich, Kelsey, & Leitten, 1993; Wright & Dismukes, 1993) and neurophysiologic mediators (Berntson, Cacioppo, & Quigley, 1993; Contrada, Del Bo, Levy, & Weiss, 1995; Obrist, 1981; Ru, 1991) of cardiovascular adjustments to environmental stressors. It also has demonstrated temporal and cross-situational consistency in cardiovascular reactivity (Kamarck, 1992), trait-like properties that encourage the view that reactivity reflects stable attributes of the person, including health-damaging personality traits (Contrada, 1994).

One of the most intensively examined hypotheses concerning personality and cardiovascular reactivity involves the Type A behavior pattern, a possible risk factor for coronary heart disease (Houston, 1988). Although meta-analysis has indicated a statistically significant association between Type A behavior and cardiovascular reactivity (Lyness, 1993), interest in Type A has waned as a result of inconsistencies in epidemiologic findings (Matthews, 1988) and data indicating only moderate intercorrelations among specific Type A behaviors (Matthews, Krantz, Dembroski, & MacDougall, 1982). Nonetheless, the body of work associated with the Type A construct continues to have conceptual and methodological implications for health psychology. It exemplifies the biopsychosocial paradigm for health research and has generated enduring substantive contributions. This article examines one of those contributions, Glass’s (1977) uncontrollability model, as a theoretical framework for the psychophysioologic study of health-damaging personality characteristics.

Glass’s (1977) model of Type A as a style of coping with potentially uncontrollable stressors remains the most comprehensive account of the Type A-reactivity association (Contrada, Leventhal, & O’Leary, 1990). In making use of this framework, the present study distinguishes between two control-related constructs that are implicit in Glass’s model. Environmental control refers to the tendency of Type A
individuals to exhibit aggressiveness and pressured drive in striving to preempt or overcome potentially uncontrollable situations (Krantz, Glass, & Snyder, 1974). Self-control refers to a tendency for Type A individuals to suppress or ignore internal states such as fatigue and emotional distress that signal potential loss of control and may interfere with efforts to master environmental demands (Carver, Coleman, & Glass, 1976).

To date, the environmental control and self-control components of Glass’s (1977) uncontrollability model have primarily been examined separately, to explain either the behavior (e.g., Glass, 1977; Dembroski, MacDougal, & Musante, 1984) or psychologic reactivity (e.g., Contrada et al., 1982; Contrada, Hilton, & Glass, 1991; Lawler, Schmied, Armstead, & Lacy, 1990) of Type A individuals. The present study extends this work by examining these two constructs simultaneously as a means of accounting for verbal-autonomic dissociation, a phenomenon not previously linked to Type A behaviors. Verbal-autonomic dissociation involves a discrepancy in the magnitude or direction of self-report and physiologic responses to a stressor. A particular pattern of verbal-autonomic dissociation, in which elevations in physiologic activity are not accompanied by commensurate increases in self-reported negative affect, has been associated with physical disorders (Gannon & Haynes, 1986; Temoshok, 1985) and with a repressive coping style suspected as a possible risk factor for disease (Weinberger, Schwartz, & Davidson, 1979).

Taken together, the two components of the uncontrollability model generate the hypothesis that Type A individuals should show a pattern of verbal–autonomic dissociation when confronted by stressful or challenging circumstances. Efforts to master potentially uncontrollable environmental demands should evoke high levels of cardiovascular activity at the same time that efforts at self-control should attenuate increases in negative affect. Accordingly, we conducted a psychophysiological study to examine cardiovascular and affective responses to a moderately difficult performance challenge. It was expected that pressured drive, as measured by the Jenkins Activity Survey (JAS; Krantz et al., 1974), would be positively associated with cardiovascular reactivity to the task. It also was predicted that self-reported negative affect among individuals high in pressured drive would not parallel their cardiovascular elevations. That is, in contrast with the cardiovascular responses of participants high in pressured drive, increases in their self-reported negative affect were not expected to exceed the increases in self-reported negative affect of those low in pressured drive.

As noted above, the pattern of verbal–autonomic dissociation that we expected to observe in participants high in pressured drive has previously been linked to a repressive coping style (Asendorpf & Scherer, 1983; Gordon & Glass, 1970; Kohlmann, Singer, & Krohne, 1989; Newton & Contrada, 1992; Weinberger et al., 1979). A review of research in this area led Weinberger (1990) to suggest that the Marlowe–Crowne Social Desirability Scale (MCSDS; Crowne & Marlowe, 1964) measures defensiveness and a desire to maintain control over negative affect, a conceptualization similar to the self-control component of the uncontrollability model of Type A behavior. To permit a comparison of the relationship between each of these constructs and verbal–autonomic dissociation, the MCSDS also was administered in the present study.

Method

Participants

Thirty-one men and 26 women enrolled in general psychology classes participated in this study in partial fulfillment of a course requirement. Participants ranged in age from 17 to 26 (M = 19.0 years) and were White or Asian. None of the participants reported having cardiovascular disease or other major illnesses. Use of oral contraceptives, tobacco, and caffeinated beverages was unrelated to scores on the JAS and MCSDS. Participants were instructed to refrain from smoking and drinking caffeinated beverages prior to the experimental session for periods of 1 and 3 hr, respectively.

Physiologic Measures

Systolic and diastolic blood pressure (SBP and DBP) were measured automatically at 1-min intervals with a Paramed Model 9350 noninvasive blood pressure monitor. The occluding cuff and transducer were placed on the participant’s dominant arm. The monitor was programmed to record blood pressure, in mmHg, as determined by the auscultatory method.

The electrocardiogram (EKG) was monitored from silver-silver chloride electrodes in a Lead II configuration using a Grass Model 7D polygraph (Astro-Med, Inc., West Warwick, RI). This provided a means of deriving heart rate (HR) measurements, in beats per minute (bpm) from the time periods between successive R-waves in the EKG record. The EKG also was used to measure T-wave amplitude (TWA) in mV.

Finger pulse volume (FPV), an index of local blood flow, was measured in arbitrary units with a photocell plethysmograph (Astro-Med, Inc., West Warwick, RI) that was attached to the index finger of the nondominant hand. The plethysmograph also was used in conjunction with the EKG signal to measure pulse transit time, that is, the time interval, in ms, beginning with the peak of the R wave of the EKG and ending with arrival of the peak of the pulse at the finger (R-PTT).

The EKG and plethysmograph signals were processed by a Gateway 40386 microcomputer using a Keithley 12-bit A/D converter with 5-ms time resolution and 200 Hz sampling rate. Signal-processing software generated beat-to-beat measures of HR, TWA, FPV, and R-PTT.

Psychological Measures

The JAS and MCSDS were administered along with questionnaires assessing health status, health-related behaviors, and medication use in a session that took place following completion of psychophysiological testing. The JAS (Form T; Krantz et al., 1974) has 21 items and yields scores reflecting individual differences in hard-driving, achievement-oriented, and time-pressured behavior. The reliability and construct validity of the JAS are well-established (Krantz et al., 1974; Matthews, 1982). The MCSDS (Crowne & Marlowe, 1964) has 33 items and yields scores reflecting individual differences in defensiveness, emotional avoidance, and self-control. Weinberger (1990) reviewed evidence supporting the reliability and construct validity of the MCSDS.
Affect was assessed with a 6-item scale consisting of the following adjectives: pressured, frustrated, impatient, on edge, uneasy, worn out. The participant indicated to what degree each adjective described his or her affect by using a 5-point scale (0 = not at all, 4 = extremely). Item responses were averaged to yield an overall score. This scale showed adequate levels of internal consistency, Cronbach's $\alpha = .73$ for baseline and .78 following task performance.

**Mental Arithmetic Task**

The mental arithmetic task was administered by a Gateway 286 PC with a standard keyboard and 12-in. monitor. Each trial was initiated by the display of a three-digit number. The participant was required to add together the three digits and then to multiply the sum by 2. A second number was then displayed, and the participant responded by entering a "Y" or "N" to indicate whether the value he or she had calculated matched the displayed value. Equal numbers of correct and incorrect responses were displayed according to a randomized schedule. Display time for both the initial three-digit number and the subsequent response value decreased as the task progressed, producing a gradual increase in task difficulty. Performance feedback followed each trial in the form of distinct auditory tones for correct and incorrect responses. Performance measures recorded by the computer program included number of problems attempted, number and proportion of correct responses, and mean reaction time. Task duration was 5 min.

**Procedure**

Participants were tested individually in a sound-attenuated room. The experimenter (Eileen M. Czarnecki) described the study as an investigation of the relationship between cognitive performance and physiologic activity. After informed consent was obtained, the participant was seated in front of a computer monitor, and two manual blood pressure readings were taken. The Paramed unit was then attached and repositioned if necessary to ensure agreement to within $\pm 7$ mmHg of the mean of the two manual readings. The EKG electrodes and plethysmograph were then attached. A 5-min baseline period followed, during which the participant sat quietly and rested alone while the experimenter initiated continuous EKG monitoring and programmed the Paramed to record blood pressure at 1-min intervals.

The experimenter then instructed the participant over an intercom system to turn over and complete the baseline affect measure. When the participant signaled that he or she had completed the measure, the experimenter reentered the testing room and gave the participant instructions for the mental arithmetic task, emphasizing the importance of accuracy, speed, and sustained effort. The experimenter then left the testing room and reentered the control room where she initiated the task. Following completion of the task, the experimenter used the intercom to instruct the participant to turn over and complete the posttask affect ratings.

**Data Reduction**

Baseline values for SBP and DBP were computed as the mean of the last two readings taken during the pretask rest period. Baseline values for FPV, HR, TWA, and R-PTT were computed as the mean of values derived from artifact-free portions of the digitized polygraph record acquired during the last 2 min of the baseline period. Similar procedures were used to derive measures of cardiovascular activity from each minute of the 5-min task period. Change scores for each minute of the task period were then calculated with reference to baseline values.

Baseline and posttask values for self-reported affect were calculated as the mean of responses to the 6-item scale administered at each of these time periods. As with cardiovascular measures, change scores were computed with reference to baseline values to quantify task-related changes in self-reported affect (Cronbach's $\alpha$ for change scores = .70).

**Results**

**Baseline Measures**

Multiple regression analyses were conducted to determine whether baseline cardiovascular and affect measures varied as a function of sex or personality scores. Body mass index (BMI; weight/height$^2$) was also included as a predictor in the analyses for the cardiovascular measures.

Results indicated significant sex differences for SBP and HR ($p < .03$), and a near-significant sex difference for DBP ($p = .06$). Men had higher SBP and DBP baselines than women ($Ms = 122.0$ mmHg and 107.8 mmHg for SBP, respectively, and $Ms = 65.8$ mmHg and 59.9 mmHg for DBP, respectively), and women had higher resting HR than men ($Ms = 79.1$ bpm and 72.8 bpm, respectively). Sex differences for blood pressure were independent of positive associations between BMI and resting levels of SBP and DBP ($p < .01$). The only other significant effect for any of the baseline cardiovascular measures was a Sex $\times$ MCSDS interaction for R-PTT ($p < .05$). Among men, high MCSDS scores were associated with shorter baseline R-PTT values (which indicate greater sympathetic stimulation), whereas there was no relationship between MCSDS scores and resting R-PTT among women.

Multiple regression analysis for baseline negative affect ratings yielded no evidence of any associations with sex or scores on the JAS or MCSDS ($p > .10$).

**Cardiovascular Reactivity to Performance Challenge**

To determine whether cardiovascular change scores varied significantly during the 5-min task period, values for each minute of the task period were submitted to repeated measures analysis of variance. There was no significant minutes effect for any of the cardiovascular measures, nor were there any significant interactions between minutes and sex or scores on the JAS or MCSDS ($p > .08$). Therefore, data for each minute of the task period were averaged together to yield a single score reflecting cardiovascular activity during task performance.

Hierarchical regression analyses were then conducted for each cardiovascular change score. In Step 1, main effect terms were entered for the appropriate baseline value, BMI, and sex. Main effect terms for the JAS and MCSDS were entered on Steps 2 and 3, respectively. Product terms representing two-way interactions involving sex, the JAS, and the MCSDS were entered on Step 4, and a product term representing the Sex $\times$ JAS $\times$ MCSDS interaction was entered on Step 5.
Regression analyses for SBP, HR, and TWA yielded similar patterns of results. In each case, the only significant term was the JAS main effect. As can be seen from the graphs displayed in Figure 1, participants with higher levels of pressured drive, as reflected in high JAS scores, showed larger elevations in SBP ($B = 1.08, \beta = 0.40, \Delta R^2 = .16, p < .01$), greater HR acceleration ($B = 0.72, \beta = 0.38, \Delta R^2 = .14, p < .01$), and more pronounced attenuation of TWA ($B = -0.004, \beta = -0.29, \Delta R^2 = .08, p < .05$). These changes are consistent in suggesting increased sympathetic nervous system activation, although for all three measures, and especially HR and TWA, results may to some degree reflect withdrawal of parasympathetic (vagal) inhibition of cardiac activity.

Analyses of the remaining cardiovascular measures indicated that higher JAS scores were associated with larger DBP elevations, but this effect was not significant ($p = .08$). The MCSDS was not associated with any measure of cardiovascular reactivity (Figure 2). The only other effects to achieve statistical significance for any cardiovascular variable were main effects involving baseline values and BMI that are not germane to the purposes of this study.

Note that because scores on the JAS and MCSDS were virtually orthogonal ($r = -.10$), relationships between the JAS and cardiovascular measures were independent of MCSDS scores.

**Subjective and Behavioral Responses to Performance Challenge**

Regression analysis for negative affect followed the same procedure used for cardiovascular measures except that BMI was not included as a predictor. As can be seen in the right-most graph displayed in Figure 2, there was a significant main effect indicating that participants high in emotional defensiveness, reflected by high MCSDS scores, reported smaller increases in negative affect ($B = -0.03, \beta = -0.27, \Delta R^2 = .07, p < .05$). A tendency for participants with high JAS scores to report smaller increases in negative affect (Figure 1, right-most graph) did not attain significance ($\beta = -0.07, ns$). As with the cardiovascular measures, the JAS and MCSDS were independent in their associations with change in negative affect. The only other significant effect was an inverse association between negative affect baselines and change scores ($p < .05$).

Regression analysis yielded no evidence that sex, JAS scores, MCSDS scores, or any interactions among these factors affected the pattern of results observed for cardiovascular or affective measures. The JAS and MCSDS were independent in their associations with change in negative affect. The only other significant effect was an inverse association between negative affect baselines and change scores ($p < .05$).

**Figure 1**. The four graphs depict the significant main effects of pressured drive, as measured by the Jenkins Activity Survey (JAS), on change in systolic blood pressure (SBP), heart rate (HR), and T-wave amplitude (TWA), and the nonsignificant effect of pressured drive on negative affect. Each graph was constructed by using raw beta weights from the corresponding regression equation. The height of the bar represents the predicted value of the dependent measure for participants scoring one standard deviation above or below the mean for the JAS ($M = 8.08, SD = 3.75$). Note that for SBP and HR, positive change scores are consistent with elevations in sympathetic nervous activity, whereas the reverse is true for TWA. bpm = beats per minute.
Emotional Defensiveness

![Graphs showing Emotional Defensiveness](image)

**Figure 2.** The four graphs depict the nonsignificant main effects of emotional defensiveness, as measured by the Marlowe-Crowne Social Desirability Scale (MCSDS), on change in systolic blood pressure, heart rate, and T-wave amplitude, and the significant effect of emotional defensiveness on change in negative affect. Each graph was constructed by using raw beta weights from the corresponding regression equation. The height of the bar represents the predicted value of the dependent measure for participants scoring one standard deviation above or below the mean for the MCSDS ($M = 14.87, SD = 4.91$). bpm = beats per minute.

Discussion

By using Glass's (1977) uncontrollability model as a framework, this study linked pressured drive, as measured by the JAS, and emotional defensiveness, as measured by the MCSDS, to similar, though nonidentical, patterns of verbal–autonomic dissociation. This extends prior research in which environmental and self-control elements of Glass's model were examined separately to account for either behavioral or physiologic responses of Type A individuals. The uncontrollability model provides a means of accounting for what might otherwise seem to be discrepancies between cardiovascular and verbal responses to behavioral challenge in individuals characterized by high levels of pressured drive or emotional defensiveness.

Rather than viewing the two response channels as separate indicators of a general state of stress, it may be useful to view each as a reflection of a different aspect of participants' adjustments to performance challenges. Enhanced sympathetic tone underlying cardiovascular reactivity is presumably driven by external, task characteristics that promote active coping efforts (Frankenhaeuser, 1979; Obrist, 1981). Difficult, potentially uncontrollable tasks appear to evoke greater sympathetic activity in individuals characterized by high levels of pressured drive. In contrast, self-reported negative affect is presumably a product of introspection. Evidence of heightened cardiovascular reactivity in pressured, driven individuals without parallel increases in self-reported negative affect may indicate that their efforts at environmental control are accompanied by self-control processes involving suppression of (Carver et al., 1976), or a shift in attention away from, an aversive internal state (Weidner & Matthews, 1978).

As in previous studies, a discrepant pattern of cardiovascular and self-report responses was observed in participants with high MCSDS scores (Asendorpf & Scherer, 1983; Weinberger et al., 1979). The MCSDS appears to identify individuals who, when confronted by stressors, show signs of self-control, such as reporting relatively low levels of negative affect (Newton & Condra, 1992) and exhibiting social smiles (Newton, Haviland, & Condra, 1996), even while manifesting autonomic arousal. This generalization should be regarded as tentative, however, because the defensive, repressive tendencies thought to be reflected in MCSDS scores have been assessed in a variety of different ways, and because seemingly related constructs have been
shown to correlate with rather different emotional response patterns (Newton & Contrada, 1994). Moreover, these associations have in some studies been shown to reflect greater increases in autonomic activity in emotionally defensive participants (e.g., Newton & Contrada, 1992), which was not the case in the present study. The discrepancy in the response of high MCSDS participants in the present study lies in the contrast between verbal report data suggesting that they experienced a smaller increase in negative affect than did their low MCSDS counterparts, and cardiovascular data suggesting that they were no less reactive autonomically.

Pressured drive and emotional defensiveness were associated with somewhat different patterns of verbal-autonomic dissociation. The JAS was positively related to cardiovascular changes and unrelated to self-reported affect (Figure 1), whereas the MCSDS was unrelated to cardiovascular reactivity and inversely related to affective change (Figure 2). This difference, and the absence of correlation between the JAS and MCSDS, complicate any effort to use the same notions of environmental control and self-control in conceptualizing pressured drive and emotional defensiveness. One possibility is that pressured drive is more closely connected to efforts at mastering external demands, and therefore to cardiovascular adjustments, with a linkage to self-control processes that is weaker or operates only when environmental control is seriously challenged (Glass, 1977). In contrast, emotional defensiveness may be more closely associated with self-control processes, and therefore more strongly related to introspective reports, provoking autonomic reactivity to environmental demands only when they pose a more salient threat to self-mastery than was produced in the present study (see Newton & Contrada, 1992). Empirical evaluation of this possibility would require examination of the JAS, MCSDS, and measures of other control-related traits in relation to cardiovascular and subjective responses to qualitatively different behavioral challenges, and might well indicate that environmental control and self-control each involve multiple aspects of personality.

Physiologic responses associated with higher scores on the JAS in this study—elevations in SBP and HR and reductions in TWA—suggest more pronounced beta-sympathetic stimulation of the cardiovascular system and a possible reduction in parasympathetic tone (Contrada, 1992; Obrist, 1981). This finding is consistent with previous research (Lyness, 1993), and may reflect mechanisms involved in the etiology of cardiovascular disorders (Krantz & Manuck, 1984). The health implications of dissociations between these cardiovascular changes and self-reported negative affect are less clear. However, verbal-autonomic dissociation may capture a process that also accounts for the tendency for individuals characterized by high levels of pressured drive to prolong exposure to demanding situations (Miller, Lack, & Asroff, 1985) and to delay seeking treatment for physical symptoms (Matthews, Siegel, Muller, Thompson, & Varat, 1983). All three phenomena may reflect inattention, misinterpretation, or lack of behavioral reponsiveness in the presence of aversive internal states. Emotional defensiveness may operate in a similar manner. In comparison with their low MCDS counterparts, participants with high MCDS scores in this study showed significantly smaller increases in self-reported negative affect despite responding with statistically equivalent elevations in cardiovascular activity. Whereas the difference in reported negative affect was very modest, and represents ratings on a limited sampling of affect terms, it is possible that it reflects a bias in cognitive appraisal, or a behavioral nonresponsiveness, that increases the health-damaging effects of aversive situations in which escape or other actions reflecting recognition of threat may be more adaptive than those driven by threat minimization.

Although the present study leaves open several important questions, it shows that Glass's uncontrollability model has heuristic value for the study of health-damaging personality traits in relation to subjective and physiological response patterns. In this connection, it is interesting to note that three sets of attributes recently identified by Schachter and Bridges (1995) as possible risk factors for physical disease all appear to involve elements of environmental control, self-control, or both. Central to one of these attribute clusters is hostility, which may be characterized by a vigilant stance toward possible interpersonal stressors, such as deception, coercion, and manipulativeness, which may be viewed as threats to control. Another cluster involves emotional suppression and repression which, as discussed above in connection with the MCDS, may involve self-control in the form of efforts to inhibit the experience or display of negative affect, or both. A third cluster includes disengagement, which can reflect helplessness, a state that Glass (1977) hypothesized would be observed in Type A individuals following failure to control environmental stressors. By explicitly viewing these person factors in terms of control-related processes, it may be possible to construct an integrative framework for understanding their health-damaging correlates.

References


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