

Facial Expression and the Affective Component of Cynical Hostility in Male Coronary Heart Disease Patients

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This study describes the affective component of hostility as measured by the Cook-Medley Hostility Scale (Ho; W. Cook & D. Medley, 1954) by examining the relationship between facial expressions of emotion and Ho scores in 116 male coronary heart disease patients. Patients underwent the videotaped Type A Structured Interview, from which facial expressions were later coded using the Facial Action Coding System. They also completed the Cook-Medley Ho scale. Facial expression of the emotion of contempt was significantly related to Ho scores; anger expression was not. Also, there was a significant interaction between hostility and defensiveness, wherein low-defensive, highly hostile people showed substantially more contempt expression than others. The implications of these findings for the construct validity of Ho and for identifying clinically important subtypes of hostility are discussed.

Key words: cynical hostility, emotion, facial expression, heart disease

The construct of hostility figures prominently in health psychology, as both an important psychosomatic concept and an empirical predictor of disease outcomes (see Smith, 1992, for a review). The Cook-Medley Hostility scale (Ho scale; Cook & Medley, 1954), which comprises 50 true-false items, has been useful in predicting the extent of coronary arteriosclerosis (Williams et al., 1980), the incidence of coronary heart disease (CHD), CHD mortality, and death from all causes (Barefoot, Dahlstrom, & Williams, 1983; Shekelle, Gale, Ostfeld, & Paul, 1983). However, Ho scores have sometimes failed to predict coronary outcomes (Dembski, MacDougall, Williams, Haney, & Blumenthal, 1985; Hearn, Murray, & Leupker, 1989), which has raised questions about the construct validity of the Ho scale (cf. Contrada & Jussim, 1992; Miller, Smith, Turner, Guijarro, & Hallet, 1996; Smith, Sanders, & Alexander, 1990). Extensive use of this instrument stems primarily from convenience (i.e., it is a subscale of the Minnesota Multiphasic Personality Inventory,

MMPI; Hathaway & McKinley, 1943). Nevertheless, given the predictive utility of Ho, there is a need to better understand what it measures.

The purpose of the present research was to explore what the Cook-Medley measures on an emotional level. We examined the relationship between facial expressions of emotion shown during the Type A Structured Interview (SI; Rosenman et al., 1964) and Ho scores in people with CHD. Previous researchers have found facial expressions useful for distinguishing between Type A and Type B individuals (Chesney, Ekman, Friesen, Black, & Hecker, 1990), but to our knowledge no research has examined the relationship between Ho scores and facial expressions of emotion.

The SI reliably elicits the Type A behavior pattern (Friedman & Booth-Kewley, 1987; Matthews, 1982), a crucial component of which is hostility. According to emotion theorists, hostility is a predisposition to experience and express anger (Ekman, 1984; Lazarus, 1991). Thus, the SI should elicit anger expression in hostile people. Earlier research suggests, however, that the Cook-Medley measures a cynical form of hostility, one characterized by distrust, resentment, and paranoia (Costa, Zonderman, McCrae, & Williams, 1986; Smith & Frohm, 1985). Thus, cynical hostility might also manifest the expression of emotions that involve social rejection, such as contempt and disgust (cf. Barefoot, 1992; Izard, 1977).

Method

Participants

The participants were 116 men who ranged in age from 42–75 years ($M = 58.91$, $SD = 8.24$)¹ and were part of a larger study of

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¹ The full sample originally included 12 women. This low figure can

behavioral aspects of myocardial ischemia conducted at the Duke University Medical Center (Blumenthal et al., 1995). All participants had documented CHD, as evidenced by prior myocardial infarction, coronary artery bypass graft, percutaneous transluminal coronary angiography, or significant coronary atherosclerosis determined by cardiac catheterization.

Procedure

We examined Ho scores and spontaneous facial behavior exhibited during the SI. Trained interviewers at Duke University Medical Center conducted the interview. Facial expression spontaneously exhibited during the SI was videotaped. As in our previous research (Blumenthal, O'Toole, & Haney, 1984), we used two alternate forms of the SI. The questions in Form A are similar but not identical to those in Form B. Facial behavior was assessed from a 2-min portion of the interview, starting with the first question relevant to anger. In Form A, this question was "When you get angry or upset, do people around you know it? How do you show it?" In Form B, the first anger question was "Most people have pet peeves. What sort of things aggravate you most?" All observable facial movement during this 2-min period was coded from the videotape, as described later. Participants completed the Ho scale during a separate session.

Facial Measurement Procedures

All facial behavior was coded using Ekman and Friesen's (1978) Facial Action Coding System (FACS). FACS is a comprehensive, anatomically based coding scheme that describes all visually distinguishable facial activity in terms of 44 unique action units (AUs), as well as several categories of head and eye positions. In using FACS, coders do not make emotion interpretations; instead they describe all the muscular movement visible in the face in terms of AUs or AU combinations.

Intercoder agreement. Two experienced FACS coders completed the scoring for this study. Both coders were unaware of the health status and hostility scores of the patients, and all coding was conducted with the videotape sound track turned off. Intercoder agreement was calculated by obtaining a ratio of the number of agreements on the AUs for each event divided by the total number of agreements and disagreements (an *event* is the AU-based description of each facial expression). The mean agreement ratio between coders across a third of the sample was .80 ($SD = .07$).

Interpretation of facial codes. The FACS codes for each event were submitted to a computer program called the FACS/EMFACS Emotion Dictionary.² The dictionary conservatively determined whether each facial event included core facial movements for certain emotions, and if so, which emotion or emotions the codes reflected. The program's interpretations draw on a rich empirically and theoretically derived database from Ekman's laboratory and others', and it has been used for the classification of spontaneous facial behavior in previous studies (e.g., Ekman, Davidson, & Friesen, 1990; Rosenberg & Ekman, 1994).

For each emotion there is a family of related facial expressions that may involve a variety of facial movements, but members of each family share core actions (Ekman, 1989). The core actions for anger involve the lowering and bringing together of the eyebrows, raising of the eyelids, and/or the tightening of the muscles in the lips. Contempt involves dimpling or tightening of the lip corner on

one side of the face or the unilateral raising of the upper lip. Disgust involves bilateral raising of the upper lip, wrinkling along the sides and bridge of the nose, or both.

Results

Descriptive Statistics

The mean Ho score was 18.96 ($SD = 7.91$). For facial expressions, all analyses used frequency data on the number of particular types of expressions. The mean number of facial expressions of any kind was 51.74 ($SD = 13.90$). For emotion expressions, the mean number was 28.00 ($SD = 18.74$). None of the expression variables differed between the two alternate forms of the SI; all analyses presented are irrespective of interview form.

Our discussion will focus on the expression categories of anger, contempt, and disgust. Exploratory analyses showed that Ho scores were not related to any other types of emotion or nonemotion facial expressions that occurred. Figure 1 depicts the frequency distributions for anger, contempt, and disgust expression.

Relationships Between Facial Expressions of Emotion and Ho Scores

Contempt expression was related to Ho ($r = .20, p = .03$), but anger and disgust expression were not ($r = -.07$ and $-.02$, respectively). Anger and disgust were minimally correlated with each other ($r = .14, p = .06$), but neither was correlated with contempt. The unique contributions of each emotion expression to Ho variability were assessed by analyzing semipartial correlations. Only contempt had a significant unique relationship with Ho ($sr = .20, p = .03$).

Exploratory Analyses on Ho and Defensiveness

In light of recent findings on the importance of defensiveness to cardiovascular reactivity in highly hostile participants (Helmers et al., 1995; Jamner, Shapiro, Goldstein, & Hug, 1991), we examined the joint influence of hostility and defensiveness on facial expressions of emotion. Scores on the Marlowe-Crowne scale (Crowne & Marlowe, 1964) were available on a subset of the sample ($n = 75$). This subset had the same mean and median hostility scores as the overall sample. Participants at or above the median Ho score of 19 were grouped as having high hostility; those below the median were considered to have low hostility. Using procedures similar to those of Helmers et al. (1995), we grouped participants into those with low and high defensiveness on the basis of Marlowe-Crowne scores ($M = 18.5, SD = 5.69, Mdn = 20$). Participants at or above 20 were classified as having high defensiveness; those below 20 were considered to have low defensiveness.

The analyses examined contempt, anger, and disgust expressions in a 2×2 analysis of variance (ANOVA) model (Hostility Group \times Defensiveness Group). To correct for

be attributed to few self- and physician referrals. Because there were not enough women in the sample to allow for analyses of sex differences, data for these participants were omitted from this report.

² The FACS/EMFACS Emotion Dictionary was developed by Wallace Friesen and Paul Ekman for use in Ekman's laboratory. It has since been replaced by the FACSaid database.

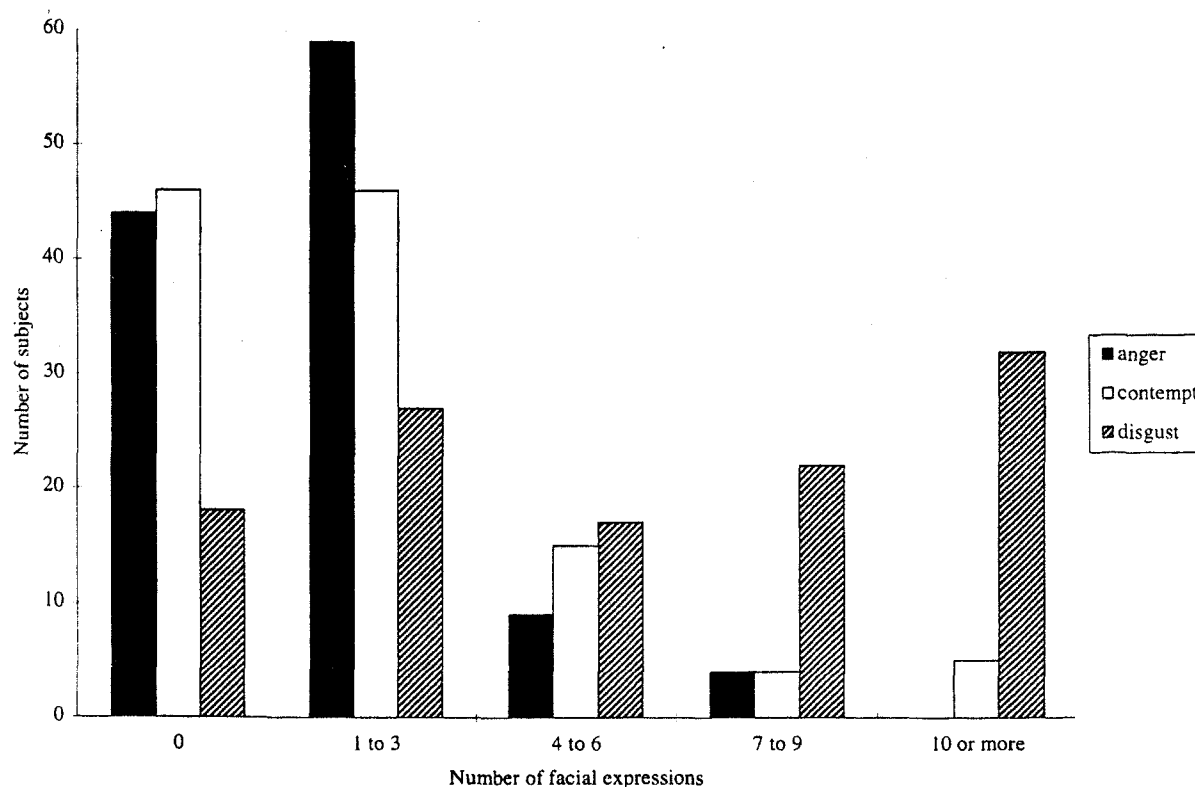


Figure 1. Frequency distributions for anger, contempt, and disgust expressions.

heterogeneity of variance, square root transformations were performed on all three expression variables (Cohen & Cohen, 1983). Then, three separate univariate ANOVAs were conducted. For contempt, there were no significant main effects, but the Hostility \times Defensiveness interaction was significant, $F(1, 71) = 4.98, p = .029$. This interaction is depicted in Figure 2. Simple effects analyses revealed that for the highly hostile group, low-defensiveness participants showed significantly more contempt than did highly defensive participants, $F(1, 71) = 7.61, p = .007$. For low-hostility participants, there was no difference in contempt expression between the two defensiveness groups, $F(1, 71) = .07, p = .79$. Highly hostile, low defensiveness participants also showed more contempt than did both of the low hostility groups, $F(1, 71) = 2.25, p = .027$; $F(1, 71) = 2.62, p = .011$, respectively, for high-defensiveness and low-defensiveness, low hostility groups. For anger, there were no significant main effects for hostility and defensiveness, but the Hostility \times Defensiveness interaction was borderline, $F(1, 71) = 3.38, p = .07$.³ For disgust, there was a significant main effect for defensiveness, $F(1, 71) = 8.54, p = .005$, whereby low-defensiveness participants showed significantly more disgust ($M = 2.63, SD = 1.34$) than those with high-defensiveness ($M = 1.66, SD = 1.26$).

Discussion

Our primary interest was to describe the affective component of Ho on the basis of facial expressions of emotion. Facial

expressions of contempt uniquely accounted for significant variance in Ho. Anger expression did not relate to Ho.

Facial Expression of Contempt as a Marker of Cynicism

The trait of cynicism and the emotion of contempt share an element of scorn for others, a rejection of others as worthy of attention (Barefoot et al., 1983; Ekman & Friesen, 1975). The present findings suggest that contempt expression may be how trait cynicism is manifest at an emotional level. Whether or not contempt expression is a reliable marker of cynical hostility awaits further research in other emotional contexts and with other populations.

³ An anonymous reviewer asked whether the form of the marginally significant interaction between hostility and defensiveness for square root anger mirrored the interaction for square root contempt, the primary concern being whether participants with high hostility/low defensiveness showed significantly more anger than did all other groups. Following are the means for square root anger for each group: low hostility/low defensiveness ($M = .74$), low hostility/high defensiveness ($M = 1.01$), high hostility/low defensiveness ($M = .79$), and high hostility/high defensiveness ($M = .36$). Thus, the pattern seen for contempt was not mirrored for anger; in fact, the only significant difference among these groups was that those with low hostility/high defensiveness showed more anger than did those with high hostility/high defensiveness $F(1, 71) = 2.46, p = .016$.

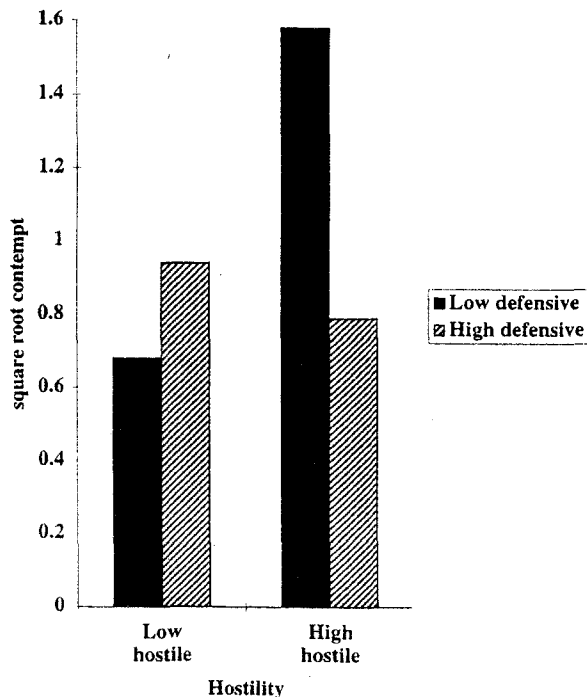


Figure 2. Contempt expression as a function of hostility and defensiveness. *N*s for each group are as follows: low hostile–low defensive, $n = 12$; low hostile–high defensive, $n = 23$; high hostile–low defensive, $n = 25$; high hostile–high defensive, $n = 15$.

Construct Validity of Ho

Anger predisposition is the defining characteristic of hostility according to many theorists of emotion (Ekman, 1984; Lazarus, 1991; Spielberger et al., 1985). We observed no relationship between anger expression and Ho scores in a context in which people talked about situations involving anger in daily life. This finding raises questions about the validity of the Ho scale as a measure of hostility per se. This conclusion is preliminary given the low frequency of anger expression in this context. We do not think, however, that the infrequency of anger expression in this study can fully account for the null relationship between anger and Ho. We report elsewhere that anger expression predicted myocardial ischemia in these participants, whereas contempt did not (Rosenberg et al., 1998). Thus, there was adequate variability in anger expression to relate to another important variable.

Defensiveness, Ho, and Facial Expressions of Emotion

Previous work indicates that men with high defensiveness and high hostility are at most risk for deleterious cardiovascular outcomes (Helmerts et al., 1995; Jamner et al., 1991). Some researchers have suggested that this is due to suppression of negative emotions, especially anger (Helmerts, 1993, as cited in Helmerts et al., 1995). We found that men with high defensiveness and high hostility showed substantially

less contempt than did men with low defensiveness and high hostility, which may indicate that high defensiveness facilitates suppression of emotions that are relevant to cynical hostility. Whether contempt suppression is unhealthy remains to be seen. The finding of more disgust expressions in men with low defensiveness than in those with high defensiveness (regardless of Ho score) may simply reflect the fact that high Marlowe-Crowne scorers tend to seek the approval of others (Crowne & Marlowe, 1964; Helmerts et al., 1995).

Issues of Generalizability

There are three primary limitations to this study. The first is the SI context. Although contempt was the only emotion related to Ho scores in the SI, this relationship may not be true across all situations. More provocative anger situations should be studied. Second, extensive subjective as well as expressive measures of emotion must be obtained in future work. Third, our results can only be generalized to male CHD patients and may not apply to healthy men or to women. We had access to this sample primarily because of the participants' involvement in a larger study on behavior and coronary disease. The Ho scores for this sample were comparable to other studies of healthy men, however (cf. Helmerts et al., 1995).

It is important to note that our conclusions pertain to hostility as measured by the Cook-Medley scale. How facial expressions of emotion relate to other hostility measures is yet to be determined. We think it is likely that measures of hostility that assess aggression (e.g., Buss & Perry, 1992) would relate to anger expression. Nevertheless, the present research provides new information about the affective nature of the Ho scale that may help us better understand the relationship of cynical hostility to coronary health.

References

- Barefoot, J. (1992). Developments in the measurement of hostility. In H. S. Friedman (Ed.), *Hostility, coping, and health* (pp. 13–31). Washington, DC: American Psychological Association.
- Barefoot, J. C., Dahlstrom, W. G., & Williams, R. B. (1983). Hostility, CHD incidence, and total mortality: A 25-year follow-up study of 255 physicians. *Psychosomatic Medicine*, 45, 59–63.
- Blumenthal, J. A., Jiang, W., Waugh, R., Frid, D. J., Morris, J. J., Coleman, R. E., Hanson, M., Babyak, M., Thyrum, E. T., Krantz, D. S., & O'Connor, C. D. (1995). Mental stress induced ischemia in the laboratory and ambulatory ischemia during daily life: Association and hemodynamic features. *Circulation*, 92, 2102–2108.
- Blumenthal, J. A., O'Toole, L. C., & Haney, T. (1984). Behavioral assessment of the Type A behavior pattern. *Psychosomatic Medicine*, 46, 415–423.
- Buss, A. H., & Perry, M. (1992). The aggression questionnaire. *Journal of Personality and Social Psychology*, 63, 452–459.
- Chesney, M. A., Ekman, P., Friesen, W. V., Black, G. W., & Hecker, M. (1990). Type A behavior pattern: Facial behavior and speech components. *Psychosomatic Medicine*, 53, 307–319.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression/*

- correlation for the behavioral sciences (2nd ed.). Hillsdale, NJ: Erlbaum.
- Contrada, R. J., & Jussim, L. (1992). What does the Cook-Medley hostility scale measure? In search of an adequate measurement model. *Journal of Applied Social Psychology*, 22, 615-627.
- Cook, W. W., & Medley, D. M. (1954). Proposed hostility and pharisaic virtue scales for the MMPI. *The Journal of Applied Psychology*, 38, 414-418.
- Costa, P. T., Zonderman, A. B., McCrae, R. R., & Williams, R. B., Jr. (1986). Cynicism, paranoid alienation in the Cook-Medley Ho scale. *Psychosomatic Medicine*, 48, 283-285.
- Crowne, D. P., & Marlowe, D. (1964). *The approval motive: Studies in evaluative dependence*. New York: Wiley.
- Dembroski, T. M., MacDougall, J. M., Williams, R. B., Jr., Haney, T., & Blumenthal, J. A. (1985). Components of Type A, hostility, and anger-in: Relationship to angiographic findings. *Psychosomatic Medicine*, 47, 219-233.
- Ekman, P. (1984). Expression and the nature of emotion. In K. R. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 319-343). Hillsdale, NJ: Erlbaum.
- Ekman, P. (1989). An argument for basic emotions. *Cognition and Emotion*, 6, 169-200.
- Ekman, P., Davidson, R. J., & Friesen, W. V. (1990). The Duchenne smile: Emotional expression and brain physiology II. *Journal of Personality and Social Psychology*, 58, 342-353.
- Ekman, P., & Friesen, W. V. (1975). *Unmasking the face: A guide to recognizing emotions from facial cues*. Englewood Cliffs, NJ: Prentice Hall.
- Ekman, P., & Friesen, W. V. (1978). *The Facial Action Coding System*. Palo Alto, CA: Consulting Psychologists Press.
- Friedman, H. S., & Booth-Kewley, S. (1987). Personality, Type A behavior, and coronary heart disease. *Journal of Personality and Social Psychology*, 53, 783-792.
- Hathaway, S. R., & McKinley, J. C. (1943). *The Minnesota Multiphasic Personality Inventory*. Minneapolis: University of Minnesota Press.
- Hearn, M. D., Murray, D. M., & Leupker, R. V. (1989). Hostility, coronary heart disease, and total mortality: A 33-year follow-up of university students. *Journal of Behavioral Medicine*, 12, 105-121.
- Helmets, K. F., Krantz, D. S., Merz, C. N. B., Klein, J., Kop, W. J., Gottdiener, J. S., & Rozanski, A. (1995). Defensive hostility: Relationship to multiple markers of cardiac ischemia in patients with coronary disease. *Health Psychology*, 14, 202-209.
- Izard, C. E. (1977). *Human emotions*. New York: Plenum Press.
- Jamner, L. D., Shapiro, D., Goldstein, I. B., & Hug, R. (1991). Ambulatory blood pressure and heart rate in paramedics: Effects of cynical hostility and defensiveness. *Psychosomatic Medicine*, 53, 393-406.
- Lazarus, R. S. (1991). *Emotion and adaptation*. New York: Oxford University Press.
- Matthews, K. A. (1982). Psychological perspectives on the Type A behavior pattern. *Psychological Bulletin*, 91, 293-323.
- Miller, T. Q., Smith, T. W., Turner, C. W., Guijarro, M. L., & Hallet, A. J. (1996). A meta-analytic review of research on hostility and physical health. *Psychological Bulletin*, 119, 322-348.
- Rosenberg, E. L., & Ekman, P. (1994). Coherence between expressive and experimental systems in emotion. *Cognition and Emotion*, 8, 201-229.
- Rosenberg, E. L., Ekman, P., Jiang, W., Babyak, M., Coleman, R. E., Hanson, M., O'Connor, C., Waugh, R., & Blumenthal, J. A. (1998). *Facial expressions of anger predict transient myocardial ischemia*. Manuscript submitted for publication.
- Rosenman, R. H., Friedman, M., Straus, R., Wurm, M., Kositchek, R., Hahn, W., & Werthessen, N. T. (1964). A predictive study of coronary heart disease. *Journal of the American Medical Association*, 189, 113-124.
- Shekelle, R. B., Gale, M., Ostfeld, A. M., & Paul, O. (1983). Hostility, risk of coronary heart disease and mortality. *Psychosomatic Medicine*, 45, 109.
- Smith, T. W. (1992). Hostility and health: Current status of a psychosomatic hypothesis. *Health Psychology*, 11, 139-150.
- Smith, T. W., & Frohm, K. D. (1985). What's so unhealthy about hostility? Construct validity and psychosocial correlates of the Cook and Medley Ho scale. *Health Psychology*, 4, 503-520.
- Smith, T. W., Sanders, J. D., & Alexander, J. F. (1990). What does the Cook-Medley hostility scale measure? Affect, behavior, and attributions in the marital context. *Journal of Personality and Social Psychology*, 58, 699-708.
- Spielberger, C. D., Johnson, E. H., Russell, S. F., Crane, R. J., Jacobs, G. A., & Worden, T. J. (1985). The experience and expression of anger: Construction and validation of an anger expression scale. In M. A. Chesney & R. H. Rosenman (Eds.), *Anger and hostility in cardiovascular and behavioral disorders* (pp. 5-30). Washington, DC: Hemisphere Publishing.
- Williams, R. B., Jr., Haney, L. T., Lee, K. L., Kong, Y., Blumenthal, J., & Whalen, R. (1980). Type A behavior, hostility, and coronary atherosclerosis. *Psychosomatic Medicine*, 42, 539-549.