

Expressive/Suppressive Anger-Coping Responses, Gender, and Types of Mortality: a 17-Year Follow-Up (Tecumseh, Michigan, 1971–1988)

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Objectives: This study examined prospectively (1971–1988) the relationship between anger-coping responses, gender, and mortality ($N = 91$) in a representative sample of men ($N = 324$) and women ($N = 372$), aged 30 to 69, from the Tecumseh Community Health Study. **Methods:** Anger-coping was measured by responses to hypothetical unfair anger-provoking situations. Cox proportional hazard regressions were used adjusted for seven health risk factors (age, smoking, relative weight, systolic blood pressure (SBP), bronchial problems, FEV₁, and cardiovascular (CV) risk). **Results:** Men's suppressed anger interacted significantly with SBP and also with bronchial problems to predict both all-cause and CV mortality. Women showed direct relationships between suppressed anger and early mortality (all-cause, CV, and cancer). Women also showed an interaction of spouse-suppressed anger and SBP for all-cause and CV mortality. Data suggest men who expressed their anger died earlier of cancer ($N = 16$) deaths. **Conclusions:** Suppressed anger at the time of an unjust attack may become chronic resentment (intermittent rage or hatred) about which little is known and requires research. The design for future research should experimentally measure both suppressed anger-coping responses (after an unfair attack) and morbidity (eg, blood pressure, bronchitis, immune disorder, etc.) to predict prospectively to earlier mortality. **Key words:** anger, blood pressure, cancer, gender, mortality.

CV = cardiovascular; FEV₁ = forced expiratory volume in 1 second; LCES = Life Change Events Study; SBP = systolic blood pressure; TCHS = Tecumseh Community Health Study.

INTRODUCTION

A long-standing hypothesis suggests a relationship between anger-hostility and cardiovascular (CV) morbidity or mortality; recent reviews have reexamined the evidence (1–3). This study examines the associations among anger-coping responses, gender, morbidity, and types of mortality (all-cause, CV, and cancer) and is a follow-up to a prior report (4) which could not examine the effects of gender or type of mortality because the total number of deaths was too few to be stratified by gender or type of mortality at that time. A literature search using MEDLINE (1966–2002) showed 169,478 journal articles with the keyword “mortality;” for “mortality and anger” the number dropped to 54; for “mortality, anger, and gender” the list included two “hits;” however, these two studies did not obtain mortality data and were not prospective.

There is no scientific agreement about the definition of anger; anger involves multidisciplinary knowledge and seems to result in more CV reactivity to imagery and exercise tests than happiness, sadness, or fear (5). Few prospective studies have used measures of “anger” as distinct from “hostility” (6, 7). Heuristic distinctions among “hostility,” “anger,” and “aggression” by psychologists are proposed by Smith (6). Hostility is defined as “a set of negative attitudes, beliefs, and appraisals concerning others...and connotes a view of others as frequent and likely sources of mistreatment, frustration, and provocation.” Anger refers to an “emotion ranging in intensity from irritation to rage, usually in response to perceived mis-

treatment or provocation...and can be seen as both an emotional state and an enduring personality trait.” Aggression refers to “overt behavior...typically defined as attacking, destructive, or hurtful actions.”

The focus in this article is on anger-coping responses to an imagined unfair aggressive verbal attack. Our heuristic thesis is that psychophysiological anger responses (including hostility) are *automatically* induced in unjust attack situations. An “attack” exists when a person appraises (8) an actual loss or a threat of loss of something believed to be owned or possessed (one's rights, health, status, etc.) through perceived arbitrary (unfair or unjust) action by others (person, group, society) or often by natural events (eg, accidents, death of others). When the attack is sudden and the owned object is strongly valued, then anger will be quick and intense. If these assumptions are valid, then anger-coping responses to an anger-inducing attack can be minimally modeled as either overtly “expressive” or “suppressive” of that anger to the attacker. Alternative measures of anger-coping modes were developed after our baseline measure in 1971 (9–11).

The concept of suppressed anger has a long history (12–14). Our use of the term “suppressed” comes explicitly from Newcomb (15) who conceived that suppression (a semiconscious process) can be *observed* by what is *omitted* in structured communication and interaction; we would add “after structured provocation.” Other studies on cardiovascular outcomes have used the concept of suppressed anger (conceived and measured in different ways), both in multiyear prospective research (16–18) and in survival after experimental studies (19–20). Besides the studies just cited relating suppressed anger and hypertension, other research has related suppressed anger to rheumatoid arthritis (21), breast cancer (22), and duodenal ulcers (23). These studies allow us to assume that chronic suppressed anger exacerbates a variety of potential or existent pathologic medical conditions and thus eventually leads to early mortality. The precise process of how this exacerbation “interacts” with medical disorders is yet unknown (24).

This conceptual framework was used to construct a dichotomous measure of anger-coping responses based partially on

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prior research (25) and developed by the lead author (26). Briefly, respondents imagine that a hypothetical unfair anger attack by a socially defined power figure has just occurred. Three items inquire as to the most likely coping responses: either show anger or not show anger to the attacker, not feel guilty or feel guilty (later) if their anger was shown directly, and protest or not protest to the attacker. We then scored these anger-coping responses as "expressed" or "suppressed."

Finally, in regard to gender and suppressed anger, one could expect that both the perception of anger-inducing situations and the anger-coping responses would differ between the genders, ie, most women more than most men tend to inhibit their anger (27, 28) and to "somaticize" (29) their depression (resigned sadness) or distress (angry sadness). As one example, in an earlier national survey, women reported feeling "hurt" when treated arbitrarily but no men used this term; this term was then coded as indicating "anger-in" which was related to female rheumatoid arthritis (21). Thus it seemed logical that women's (rather than men's) suppressed anger might be more related to morbidity and earlier mortality.

The specific hypotheses of the present analysis guided testing for: 1) an association between expressed/suppressed anger-coping and blood pressure; 2) an association between expressed/suppressed anger-coping and mortality; and 3) an interactive relationship of expressed/suppressed anger and chronic disease conditions (elevated blood pressure or respiratory problems) with mortality. The association between anger-coping indices and mortality would also be explored for each of these hypotheses by gender.

MATERIALS AND METHODS

Sample

The Life Change Events Study (LCES), a sociopsychological study of life change events, anger-coping responses, and psychologic well-being, was carried out as part of the fourth series of examinations (1971–1972) of the Tecumseh Community Health Study (TCHS). Subjects for this study were selected from a representative sample of the TCHS, a longitudinal epidemiological study of a Michigan community begun in 1959; a detailed description of the overall TCHS design has been presented elsewhere (30). The study population for the fourth series of examinations consisted of men and women aged 30 to 69, who also participated in the third series of examinations (1967–1969). The total response rate in the fourth medical test series was 88% ($N = 6012$). From this return, the LCES selected a 20% random sample that yielded 1214 persons. Individuals with diagnosed respiratory or rheumatic disease at the third series, who were part of another study ($N = 361$) were excluded. Also excluded were 20 subjects (2%) over 70 years of age in 1971. From the remaining 833 individuals selected, 696 (84%) agreed to participate in the LCES. The demographic characteristics of this sample are similar to the total community in 1971 to 1972. Tecumseh, a town of about 10,000 people, had a predominately white, Anglo-Saxon, middle-class population of whom 88% were married.

Data were collected in the TCHS clinic from 1971 to 1972. Demographic and health-related information was obtained by a standard TCHS questionnaire. Subjects for the LCES also completed the psychosocial questionnaire. Morbidity was diagnosed in the third series of examinations (1967–1969) for cardiovascular risk, bronchial problems, and FEV₁.

Mortality status was ascertained from death certificates and medical reports from 1978 to 1979 for virtually every respondent who had ever participated in the Tecumseh Project. After 1979, mortality status was updated by screening daily reports in local newspapers and by follow-up contact with relatives. To estimate the bias in mortality status after 1979, separate

survival models were fitted using the mortality status of 1979 and the mortality status of 1988. The point estimates obtained by the two models were similar. For males, the total anger suppression index using mortality 1979 had an adjusted RR = 1.00 (95% CI = 0.70–1.40) and mortality 1988 had an adjusted RR = 1.01 (95% CI = 0.82–1.23). For females, mortality 1979 yielded an adjusted RR = 1.36 (95% CI = 0.83–2.21) and for mortality 1988 an adjusted RR = 1.44 (95% CI = 1.04–1.98). The ascertainment after 1979 does not seem to severely bias the estimates; therefore the mortality status of 1988 is used in this paper. Between 1971 and 1988, 91 (13.1%) respondents of the total LCES ($N = 696$) had died, 17.3% of the men ($N = 56$) and 9.4% of the women ($N = 35$). These death rates were similar to the full project population.

The *types of mortality* used in this analysis were: 1) all-cause; 2) cardiovascular, which includes six ICD-9 categories: hypertensive disease (401–405), ischemic heart disease (410–414), diseases of the pulmonary circulation (415–417), other forms of heart disease (420–429), cerebrovascular disease (430–438), and diseases of arteries, arterioles, and capillaries (440–448); and 3) cancer, all types.

Anger-coping types were assessed using a format developed by Harburg et al. (26). All subjects responded to two hypothetical anger-provoking situations involving injustices perpetrated by a power figure termed an (unjustified) "attack" throughout the paper (see Appendix A). For each attack role situation (spouse or police) separate anger, guilt, and protest scores were constructed by recoding responses to the six items as follows: items 1 and 4 (show anger), responses 1, 2 were coded as "0" for "show anger" and responses 3 to 5 were coded as "1" for "not show anger." For items 2 and 5 (guilt), responses 1 to 3 were recoded as "1" for "guilt" and response 4 was recoded as "0" for "no guilt." For items 3 and 6 (protest), item responses 1, 2 were coded as "1" for "not protest" and item responses 3, 4 were coded as "0" for "protest." It is assumed that each recoded item is an indicator of either an expressive (score "0") or suppressive (score "1") anger process. Thus, "show anger," "not feel guilt," and "protest" were each scored "0" and "not show anger," "feel guilt," and "not protest" were each scored "1." This method requires recoding to a two-point scale *after* the respondent chooses from a five-point scale. We expect this recoding to increase test-retest reliability and validity, though this might result in some loss of statistical power and information. The aim is to describe accurately a two-category measure: express or suppress anger-coping. The increase in reliability occurs because respondents can choose to report (eg, either "anger" or "annoyed") which then can be collapsed into a new response (for example, see Appendix A, item 1, where response values 1 and 2 are collapsed into "show anger"). Thus, minor changes in test-retest values will be merged in such new responses. If two of three recoded responses for each attack situation are "suppress," then that person is categorized as coping by suppressing anger; otherwise they are categorized as coping by expressing anger.

Cumulative anger-guilt-protest indices of suppressed anger were also developed separately for each attack role situation (spouse or police) and for the total index across both situations. These measures were constructed by summing the recoded responses described above. Thus, for each role situation (spouse or police) those persons with a high score (2–3 of 3 items) on an anger-guilt-protest index are more likely to not show their anger, feel guilty, or not protest an unjustified attack. We label these indices as "suppressed anger" and designate the specific role situation as suppressed anger spouse index or suppressed anger police index. The range was 0 to 3 for spouse and police suppressed anger indices. The score of the six items derived from both role situations is labeled as the suppressed anger total index (Appendix B). All suppressed anger indices were used as continuous variables in regression models because no significant differences between using a continuous or ordinal scale were found. The strength of this anger-coping measure relies mostly on its external validity; the measure has been applied by a number of different researchers across a variety of populations (26, 31–35).

Health risk factors were ascertained during the medical test series interviews and medical tests (1971–1972) and included age in years, cigarette smoking, relative weight, blood pressure, and education in years. *Blood pressure* was measured with a mercury sphygmomanometer. All readings were taken with the subject seated and using his/her right arm. Both systolic pressure and diastolic (fifth phase) pressure were recorded. Three indicators

of *physical status and morbidity* obtained at the third series of examinations from 1967 to 1969 were also included as possible confounding variables. They are: 1) a diagnosis of suspect or probable CHD, defined as a probable history of myocardial infarction, angina, or electrocardiographic evidence of myocardial infarction (Minnesota codes 1-1 or 1-2); 2) bronchial problems (suspect or possible), chronic bronchitis, or persistent cough or phlegm; and 3) FEV₁ values adjusted for gender, age, and height using the FEV₁ values of the nonsmoking respondents without respiratory disease or symptoms and reversed so that higher scores indicate *lower* FEV₁.

Statistical Methods

The Cox proportional hazard model was used to model the survival curves from 1971 until 1988. The survival time for each individual was calculated as the difference between the date of death and the starting date for the cases who died, and the difference between the date of last contact and the starting date for those who were still alive in 1988, ie, those were censored at the end of the study. The health-related factors (health risk and medical) measured in this study were investigated using Cox modeling to assess the impact of each factor separately on survival for all three types of mortality. Then Cox models including these health-related factors and each anger-coping measure singly and as interaction terms were derived. Finally, as systolic and diastolic measures were highly correlated (for males, $r = 0.72$; for females, $r = 0.78$), the inclusion of both in multiple adjustment equations could result in multicollinearity; therefore, in this paper, only regression results for systolic pressure are presented. The education variable was also removed from the model because it was highly insignificant and did not contribute significantly to the log likelihood function.

RESULTS

To test the expected relationships between the health-related factors and mortality, and to partially test the external

validity of our sample, relative risk estimates were computed using the Cox proportional hazard regression test, stratified by gender (Table 1). Results confirm for all-cause mortality that age and systolic blood pressure (SBP) were significant predictors for each gender. For males, FEV₁, and for females, being a smoker, were respiratory variables predicting independently to all-cause death. Similarly for CV mortality, age and SBP were significant predictors for men and women; for men, relative weight, and for women, being a smoker, were each separate predictors to CV death. For cancer deaths, only age was an independent predictor for each gender.

The first hypothesis predicted that indices of suppressed anger would be related to blood pressure; none of the anger indices were significantly related to blood pressure levels for either gender (data not shown). The second hypothesis was to test the association between anger-coping indices and mortality adjusted for all risk factors and gender. Results in Table 2 based on Cox regression for the entire sample ($N = 696$) show that the adjusted relative risk of total anger index was related to all-cause mortality ($RR = 1.14$, 95% CI = 0.98–1.32, $p < .10$); the police index showed $RR = 1.21$ (95% CI = 1.01–1.46, $p < .05$) but the spouse index was not significant. For CV mortality, the total anger index showed $RR = 1.27$ (95% CI = 1.03–1.57, $p \leq .05$); the police index showed $RR = 1.54$ (95% CI = 1.18–2.02, $p \leq .01$). Again, no effects of the spouse anger index were observed. For cancer deaths, there

TABLE 1. Cox Regression Risk Ratios and 95% CI of All-Cause Mortality for Health Risk Factors by Gender

Health Risk Factors	Risk Ratio 95% CI	
	Men ($N = 324$)	Women ($N = 372$)
All-cause mortality	(56 Deaths)	(35 Deaths)
Age (years)	1.09 (1.05–1.12)**	1.11 (1.07–1.16)**
Smoker (no/yes)	1.26 (0.69–2.28)	2.63 (1.21–5.72)*
Relative weight	1.00 (0.98–1.01)	1.00 (0.98–1.02)
Systolic BP	1.03 (1.01–1.04)**	1.03 (1.01–1.04)**
High school grad	0.98 (0.47–2.05)	0.85 (0.31–2.31)
Bronchial problem	1.38 (0.73–2.59)	1.40 (0.59–3.30)
FEV ₁	1.30 (1.04–1.62)*	1.14 (0.78–1.67)
Cardiovascular risk	1.38 (0.62–3.07)	0.97 (0.13–7.24)
Cardiovascular mortality	(27 Deaths)	(16 Deaths)
Age (years)	1.07 (1.02–1.12)**	1.12 (1.05–1.19)**
Smoker (no/yes)	0.72 (0.28–1.82)	5.38 (1.61–18.0)**
Relative weight	0.98 (0.95–1.00)*	1.01 (0.99–1.04)
Systolic BP	1.05 (1.02–1.07)**	1.04 (1.02–1.06)**
High school grad	1.34 (0.49–3.64)	1.69 (0.47–6.03)
Bronchial problem	1.04 (0.39–2.75)	0.73 (0.17–3.22)
FEV ₁	1.18 (0.86–1.61)	1.10 (0.61–2.01)
Cardiovascular risk	1.07 (0.29–3.96)	3.39 (0.41–28.0)
Cancer mortality	(15 Deaths)	(14 Deaths)
Age (years)	1.12 (1.05–1.19)**	1.10 (1.03–1.18)**
Smoker (no/yes)	2.57 (0.79–8.40)	1.60 (0.49–5.23)
Relative weight	1.02 (0.99–1.06)	0.99 (0.96–1.01)
Systolic BP	0.99 (0.95–1.02)	1.01 (0.98–1.04)
High school grad	1.35 (0.36–5.03)	0.40 (0.05–3.20)
Bronchial problem	1.70 (0.51–5.61)	1.56 (0.39–6.16)
FEV ₁	0.85 (0.52–1.39)	0.94 (0.52–1.70)
Cardiovascular risk	1.97 (0.51–7.59)	0.00 not estimated

* $p < .05$, ** $p < .01$. Higher scores for FEV₁ indicate lower capacity.

TABLE 2. Cox Regression Risk Ratios and 95% CI for Type of Mortality by Suppressed Anger Indices and Gender

Suppressed Anger Indices	RR (95%) CI		
	Men (N = 324)	Women (N = 372)	Total (N = 696)
All cause mortality	(56 Deaths)	(35 Deaths)	(91 Deaths)
Spouse index	0.97 (0.76–1.24)	1.44 (1.04–1.98)*	1.10 (0.90–1.33)
Police index	1.05 (0.82–1.34)	1.64 (1.20–2.34)**	1.21 (1.01–1.46)*
Total index	1.01 (0.82–1.23)	1.42 (1.12–1.80)**	1.14 (0.98–1.33)+
Cardiovascular mortality	(27 Deaths)	(16 Deaths)	(43 Deaths)
Spouse index	0.99 (0.70–1.42)	1.62 (1.00–2.64)*	1.14 (0.86–1.52)
Police index	1.40 (1.00–1.96)*	2.28 (1.34–3.86)**	1.54 (1.18–2.02)**
Total index	1.15 (0.87–1.52)	1.70 (1.17–2.47)**	1.27 (1.03–1.57)*
Cancer mortality	(15 Deaths)	(14 Deaths)	(29 Deaths)
Spouse index	0.81 (0.48–1.35)	1.24 (0.74–2.09)	1.00 (0.69–1.44)
Police index	0.52 (0.28–0.97)*	1.50 (0.94–2.39)+	0.97 (0.69–1.35)
Total index	0.70 (0.43–1.15)	1.32 (0.91–1.91)	1.00 (0.75–1.33)

* $p < .05$; ** $p < .01$; + $p < .10$. All estimates are adjusted for age, smoking, relative weight, SBP, bronchial problems, FEV₁, and cardiovascular risk.

were no significant effects of any of the anger indices on mortality. In summary, these data show evidence to support our second hypothesis that there is an association of anger-coping and mortality.

We next explored the relationship of anger-coping indices on mortality separately by each gender, including adjustment for all the health risk factors. Data in Table 2 show that women's suppressed anger is directly related to their risk of earlier mortality for all-cause, CV, and cancer endpoints. The significance of these relationships appears for specific suppressed anger indices for all-cause and CV deaths and the police index for cancer mortality. However, for men there are only two significant results ($p < .05$), each relating police suppressed anger to CV and to cancer mortality; furthermore, the results for cancer indicate an opposite direction from women – specifically, men appear at *less* risk if they report suppression of anger to a police attack.

Figure 1 reinforces the findings of Table 2 using survival curves to describe the actual death experience along a time dimension; curves are dichotomized by expressed/suppressed anger indices for presentation and adjusted for the seven health risk factors. (The statistical significance of these relations are indicated in Table 2.) These curves show that the tendency for earlier deaths by those suppressing anger for all-cause, CV, and cancer mortality occurred throughout the 17-year period, significant only for females. Figure 1, however, also shows the gender differences in the opposite direction for cancer mortality – specifically, for men, those who reported suppression of anger to unjustified verbal attack by spouse and police show more longevity than men who expressed their anger. For men only (Table 2), the police index is significant (RR = 0.52, 95% CI = 0.28–0.97, $p < .05$); but this result is different in direction from females whose suppressed anger risk ratio for police is RR = 1.50 ($p < .10$).

Our third hypothesis required testing for interaction effects among anger indices and the following health risk factors: SBP and three respiratory health risk factors – smoking, FEV₁, and bronchial problems – as they relate to predicting

mortality. The Cox proportional hazards regression statistic was again used to test these associations; all tests were adjusted for the seven health-related factors and always included the corresponding main effect anger index being assessed as both a main effect and as an interaction with the specified risk factors. There were no interaction effects on mortality of anger indices and smoking or FEV₁ and none for cancer mortality (data not shown). Data in Table 3, however, show significant interaction effects among anger indices with SBP and with bronchial problems for predicting mortality, again showing clear gender differences. For all-cause mortality, for men, SBP interacted significantly with all three anger indices ($p < .05$), indicating that higher SBP and higher suppressed anger interacted to predict earlier mortality. Bronchial problems and the police index and the suppressed anger total index also showed significant interaction effects on this mortality. For women, for all-cause, the spouse index and SBP interacted significantly ($p < .05$). For CV mortality, for men, bronchial problems interacted significantly ($p < .01$) with the police index (RR = 4.68, 95% CI = 1.84–11.9) and with total index (RR = 2.90, 95% CI = 1.40–6.02). For women, again (as with all-cause) only the spouse index interacted significantly with SBP and mortality (RR = 1.04, 95% CI = 1.01–1.07, $p < .01$).

Figure 2 illustrates for men how these combinations of suppressed anger indices and SBP appear when these variables are dichotomized and unadjusted for the purpose of presentation. Clearly, elevated SBP ≥ 140 mm Hg compared with < 140 mm Hg predicts to higher mortality rates as expected. However, data in Figure 2 for males show that the combination of suppressed anger and elevated SBP predicts to significantly higher all-cause mortality than for those with elevated SBP who express their anger. Note the seemingly paradoxical results for men: those who suppress their anger (total index) with low SBP (< 140 mm Hg) have almost half (8.6%) the all-cause mortality than the average male mortality rate (17.3%) and their total index shows almost five times fewer deaths than men who also suppress their anger and who

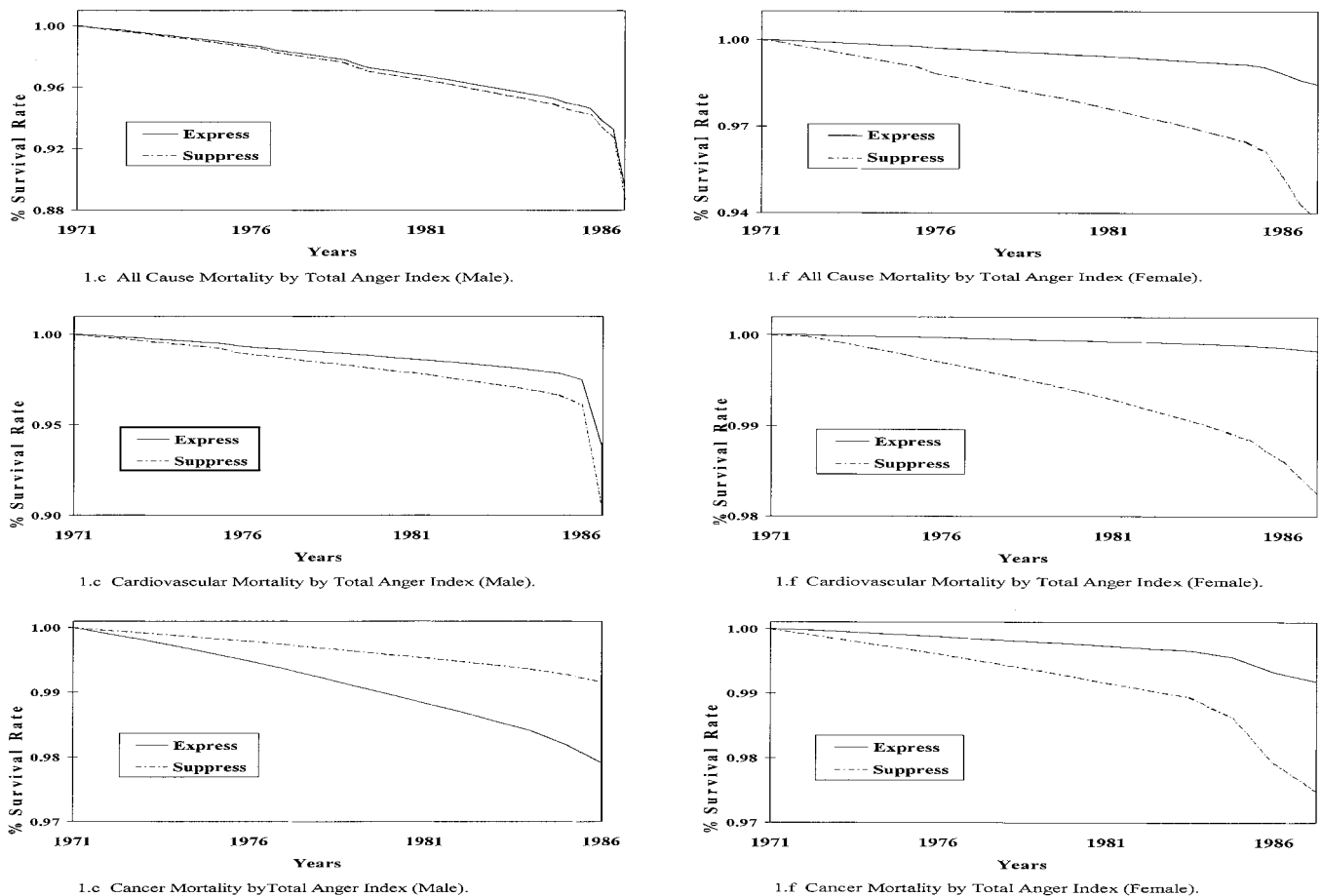


Fig. 1. Survival curves for all-cause, CV, and cancer mortality by total suppressed anger indices and gender, adjusted for age, smoking, relative weight, SBP, bronchial problems, FEV₁, and cardiovascular risk (see Table 2).

TABLE 3. Cox Regression Risk Ratios and 95% CI for Types of Mortality for Suppressed Anger Indices and Interactions with SBP and Bronchial Problems by Gender

Suppressed Anger and Interactions	Men (N = 324)	Women (N = 372)
	Risk Ratio 95% CI	Risk Ratio 95% CI
All-Cause Mortality	(56 Deaths)	(35 Deaths)
SBP × spouse index	1.01 (1.001–1.03)*	1.02 (1.001–1.03)*
SBP × police index	1.02 (1.001–1.03)*	1.01 (0.99–1.02)
SBP × total index	1.01 (1.001–1.03)*	1.01 (0.995–1.02)
Bronch. × spouse index	1.38 (0.83–2.29)	0.92 (0.43–1.95)
Bronch. × police index	2.28 (1.35–3.86)**	0.56 (0.27–1.14)
Bronch. × total index	1.69 (1.08–2.64)*	0.83 (0.48–1.45)
Cardiovascular Mortality	(27 Deaths)	(16 Deaths)
SBP × spouse index	1.01 (0.99–1.03)	1.04 (1.01–1.07)**
SBP × police index	1.01 (0.99–1.03)	1.01 (0.98–1.03)
SBP × total index	1.01 (0.99–1.03)	1.01 (0.99–1.03)
Bronch. × spouse index	1.61 (0.74–3.53)	0.90 (0.26–3.06)
Bronch. × police index	4.68 (1.84–11.9)**	0.61 (0.18–2.09)
Bronch. × total index	2.90 (1.40–6.02)**	0.99 (0.42–2.37)

* $p < .05$; ** $p < .01$. All estimates are adjusted for age, smoking, relative weight, bronchial problems, FEV₁, systolic blood pressure, and cardiovascular risk. There were no interactions predicting to cancer.

have high SBP (≥ 140 mm Hg). This effect appears for all three suppressed anger indices and is perhaps due to the contrary direction of anger for cancer mortality. For females,

for all-cause and CV mortality, similar bar charts (not shown) supported the significant interaction effects of SBP and the spouse anger index seen in Table 2.

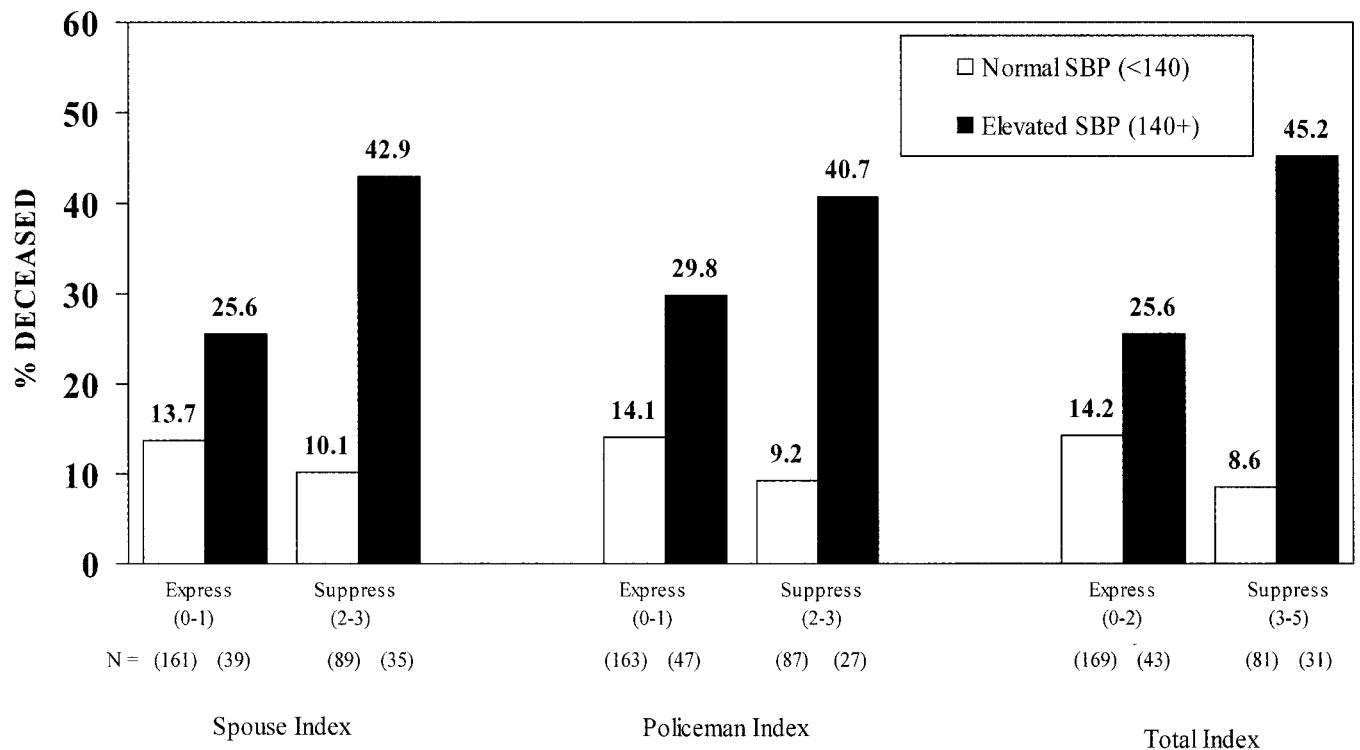


Fig. 2. Percent deceased for male all-cause mortality rate (unadjusted) by express/suppress anger indices for spouse and policeman and total indices and normal and elevated SBP scores: Tecumseh, Michigan, 1971–1988 (see Table 3).

Figure 3, *A* and *B*, presents data using dichotomous (for presentation) suppressed anger indices and dichotomous SBP for males and females, respectively, for CV mortality (unadjusted). These results again describe for both men and women that the *combination* of suppressing anger and having elevated SBP seems to predict higher CV mortality rates in this sample than for those who express their anger having elevated SBP (most clearly seen using the total index).

DISCUSSION

Our data revealed that suppressed anger predicted directly to early mortality for women but not for men. Comparison, however, of suppressed anger between genders presents problems. In data from this present sample, for example, men significantly suppressed anger responses *more* to their wives (mean score for spouse suppression anger index = 1.29) than women did to their husbands (mean score = 1.09, $p < .01$). With a police attacker, however, men suppressed their anger *less* (mean score = 1.20) than women (mean score = 1.34, $p < .10$). These differences in anger-coping between gender groups may be due largely to percent changes in perception and to response to different gender-authority attackers. Thus men and women differ in their suppression of anger-coping responses conditioned by the role and gender of the attacker. Too often in research the power and gender of the attacker are not designed for tests of comparison with the power and gender of the person attacked. In this study we regard suppressed anger as a “response” to unfair attack; if the person responds with suppressed anger toward a variety of attackers

across multiple situations, then one would be measuring a “trait” (35).

Our findings also show as hypothesized that suppressed anger interacted with SBP to predict early mortality for both men and women (Table 3). Conclusions from a small sample (16 male, 16 female college students) suggest that hemodynamic mechanisms after stressors differed consistently between genders (36). The highest reactivity occurred during an experimental role play of a socially unjust situation (but not an aggressive attack). Females showed greater increases in heart rate, cardiac output, and decreased total peripheral resistance compared with men who showed consistent increase in total peripheral resistance to all five stressor modes. Women were more “heart stricken” by these stressor events than men. A study of reactivity as well as recovery from anger provocative stimuli and anger release also showed differential gender-related anger-coping CV responses (37). Are these gender-specific physiologic responses reiterated when the unjust stressor event is rearoused through memory? Are these responses increased with repetitions of the actual unfair attacks as in daily marital or occupational life? If the emotion of anger/fear occurring in these daily events is chronically suppressed, do morbid physical conditions emerge? Or does chronic suppression “interact” with an incipient morbid disequilibria to generate frank morbid disorder?

In another psychophysiological study, 58 college women (38) were asked to “recall a time when they had become very angry” in a probing interview coded later into four anger-coping responses: suppression, cognition, assertion, aggres-

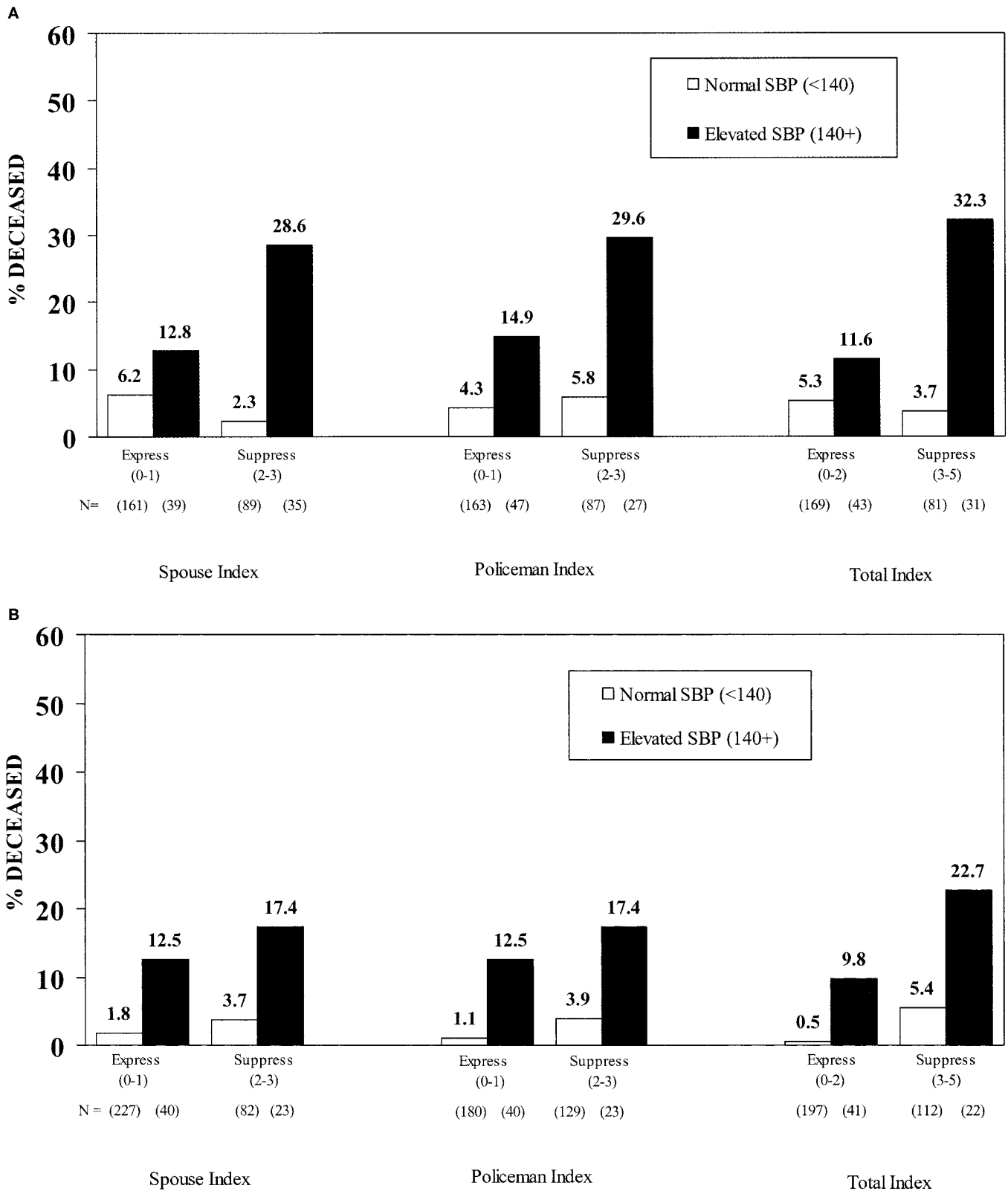


Fig. 3. *A.* Percent deceased for male CV mortality rate (unadjusted) by express/suppress anger indices and normal and elevated SBP scores: Tecumseh, Michigan, 1971–1988 (see Table 3). *B.* Percent deceased for female CV mortality rate (unadjusted) by express/suppress anger indices for spouse and policeman and total indices and normal and elevated SBP scores: Tecumseh, Michigan, 1971–1988 (see Table 3).

sion; heart rate and blood pressure were monitored at baseline and after the interview. Results showed higher SBP reactivity for those women who coped using a suppressed mode and the lowest SBP reactivity with an assertive mode. The highest SBP reactivity was for the *combination* of Type A women who also suppressed their anger; the lowest SBP was for those Type B women who were assertive. Whether reactivity in experimental results is useful, however, to predict morbidity or mortality requires a *combined* risk analysis in prospective research (39, 40). In the present prospective data for *both* men and women, the statistical *interaction* of a suppressive mode with elevated SBP was significantly related to earlier deaths (Table 3). This result is suggestive of finding early CHD mortality in a 27-year follow-up of men where a triple *combination* of Type A, high hostility, and elevated SBP showed the highest rates of earlier deaths in survival curves across six health risk groups (41).

It is reasonable to assume that a suppressor response to attack rather than an expressive response would likely lead to an internal process of resentment (10). Our theory explicitly assumes that chronic perception of arbitrary attacks by others results in intermittently but continuously aroused anger/hostility. Each single attack (police) or several over time (spouse) where one's anger is kept suppressed may be retained in memory, revived in imagery or fantasy, and reexperienced as the original event (5). This private recall of unfair dispossession (of self-esteem, social status, property) can keep rearousing the anger, including hostile attitudes. This private, chronic, iterative rearousal of anger/hostility due to the perception of chronic social attack is the sociopsychobiological toxic process we term chronic resentment. Colloquially, this is termed "hatred" or "rage," which most Americans do not want or are unable to report, and is a form of extreme anger that is only rarely the focus of sociopsychosomatic research.

Chronic resentment can impede communication and interaction by *omission* of material required for a social resolution of problems and thereby serves to exacerbate the internal intermittent anger responses. To solve this chronic resentful condition involves a perceived restoration of status (eg, apology, reappraisal, restitution, etc.) (42). Being a member of a status group that faces chronic attack due to gender, ethnicity, religion, etc. (43) can induce, in an unknown proportion of persons, the basis for chronic resentment, perhaps pressured by the daily stress of low income (44), low "life chances," and chronic relational discord. Chronic resentment is complex (45) and can induce chronic disequilibrium in bodily systems (24) (eg, circulatory, bronchial, immune) (46–48) generating or influencing chronic morbidity (49) leading to early death. We suggest that the "interaction" of suppressed anger and high blood pressure levels, as in the present research, may be partially generated by chronic resentment and an absence of a reflective mode of anger-coping (try to resolve the problem).

Our results for cancer deaths must be viewed with caution because of the low number of deaths (male = 16, female = 14). These findings, however, show a marked gender disparity: For women, a *suppressed* anger index was related to

cancer death; for men, survival curves and risk ratios show that *expressed* anger was related to earlier cancer death. An earlier study on men and lung cancer, however, contradicts this direction, ie, suppressed anger was related to increased lung cancer (50). An earlier study of cancer in women showed that the diagnosis of breast cancer was significantly related to a priori measures of both "extreme suppression" of anger and also to a smaller portion with "extreme expression" (51). This result would be termed "resentful" anger (10).

The findings in this study are subject to a number of limitations that urge caution in assessment. The research was carried out in a small, semirural, ethnically homogeneous (Anglo-Saxon) community with little socioeconomic diversity or conflict; generalizing to larger, ethnically diverse, socioeconomically disparate populations would be problematic. Furthermore, whereas the study had complete ascertainment of death certificates up until 1979, after this date to 1988 the deaths were obtained through newspaper obituaries; although death confirmation evidence from relatives was rigorously gathered within this small community, selection effects could not be avoided. Patently, our mortality data are sparse. Finally, the measure of anger-coping used in this study is not part of standard psychological inventory; it has a different measurement strategy and is derived from theory (see Methods).

This study is preliminary. The findings, however, provide further evidence of the relationships between anger and early mortality as suggested by others (1–3). Future research should involve experimental anger-coping-induced reactivity with recovery data and also measure precursors to morbidity or morbid conditions and follow-up with early CV mortality. A measure of sociopsychophysiologic chronic resentment should be developed. This effort first requires concepts and measures of anger-coping response which describe both psychologic and physiologic/chemical changes simultaneously after perceived chronic or traumatic, unfair, aggressive attack.

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APPENDIX

Appendix A^a

The format measuring anger-coping responses to an unfair verbal attack^b is as follows:

1. Now some questions about your feelings. First, imagine that you were doing something outside and a policeman yelled in anger or blew up at you for something that wasn't your fault, how would you feel? (Circle one)
 - 1 I'D GET ANGRY OR MAD AND SHOW IT
 - 2 I'D GET ANNOYED AND SHOW IT
 - 3 I'D GET ANNOYED BUT WOULD KEEP IT IN
 - 4 I'D GET ANGRY OR MAD BUT WOULD KEEP IT IN
 - 5 I WOULD NOT GET ANGRY, MAD, OR ANNOYED
2. Suppose you got angry or mad at him and *showed* him that you felt this way. How would you feel about it *later* if you did this? (Circle one)

^a The method requires collapsing the codes *after* the respondent chooses from a five-point scale to a two-point scale.

^b The attacker could be a "doctor," "nurse," "boss," "father," or "mother" or any alter-role power figure acting arbitrarily or unfairly in an angry/insulting attack.

ANGER, GENDER, MORTALITY

- 1 I'D FEEL *VERY* GUILTY OR SORRY^c
- 2 I'D FEEL GUILTY OR SORRY
- 3 I'D FEEL SLIGHTLY GUILTY OR SORRY
- 4 I WOULDN'T FEEL AT ALL GUILTY OR SORRY
3. If a policeman really did get angry with you for something that wasn't your fault, what would you most likely do about it at the time? Would you most likely... (Circle *one*)
 - 1 JUST KEEP QUIET
 - 2 JUST LEAVE
 - 3 PROTEST A *LITTLE*
 - 4 PROTEST *STRONGLY* TO THE POLICEMAN EITHER BY DOING OR SAYING SOMETHING
4. Next, about your spouse or sweetheart. Imagine that your (husband/wife/or sweetheart) yelled in anger or blew up at you for something that wasn't your fault, how would you feel? (Circle *one*)
 - 1 I'D GET ANGRY OR MAD AND SHOW IT
 - 2 I'D GET ANNOYED, AND WOULD SHOW IT
 - 3 I'D GET ANNOYED BUT WOULD KEEP IT IN
 - 4 I'D GET ANGRY OR MAD BUT WOULD KEEP IT IN
 - 5 I WOULD NOT GET ANGRY, MAD, OR ANNOYED
5. Suppose *you* got angry or mad at (him/her) and showed (him/her) that you felt this way. How would you feel about it *later* if you did this? (Circle *one*)
 - 1 I'D FEEL *VERY* GUILTY OR SORRY (c)
 - 2 I'D FEEL GUILTY OR SORRY
 - 3 I'D FEEL SLIGHTLY GUILTY OR SORRY
 - 4 I WOULDN'T FEEL AT ALL GUILTY OR SORRY

^c "Guilty or sorry" should be changed to "guilty or afraid."

6. If (he/she) really did get angry at you for no good reason, what would you most likely do about it at the time? Would you... (Circle *one*)
 - 1 JUST REMAIN QUIET
 - 2 LEAVE THE ROOM
 - 3 PROTEST A *LITTLE*
 - 4 PROTEST *STRONGLY* TO (HIM/HER) EITHER BY DOING OR SAYING SOMETHING

Appendix B

A total score of the six items from the spouse and police responses (see Methods) was formulated as shown.

Appendix B. Derivation of the Suppressed Anger Total Index

	Spouse Index Score	Police Index Score	Total Suppressed Anger Score
Item 1	0	0	0
Item 2	1	0	1
	1	1	
	0	1	
Item 3	2	0	2
	2	1	
	1	2	
	0	2	
Item 4	3	0	3
	3	1	
	2	2	
	1	3	
Item 5	0	3	4
	3	2	
	2	3	
Item 6	3	3	5