The Ketterer Stress Symptom Frequency Checklist: Anger and the Severity of Coronary Artery Disease

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Mark W. Ketterer, PhD†

Recent research suggests that the most potent feature of the Type A behavior pattern for prospectively predicting cardiac disease is aggravation, irritation, anger, and impatience (AIAI). The present study examines psychometric properties of a new AIAI measure and its relationship to the severity of coronary artery disease (CAD). Subjects included 61 males undergoing coronary angiography. Comparisons were made of mean psychometric scores across groupings, defined by number of vessels occluded. These comparisons showed that the normal or subclinically occluded coronary angiographic group had high levels of depression and anxiety. Higher levels of AIAI were observed in patients with multivessel CAD compared to those with single vessel disease. Because of their psychological abnormality, the normal and subclinically occluded angiographic patients are an inappropriate control group for AIAI studies intended to address the etiology of CAD. Nonetheless, evaluation of these patients for the presence of depressive and anxiety disorders frequently has clinical importance. (Henry Ford Hosp Med J 1990;38:207-12)

In his late forties, John Hunter, the father of modern scientific surgery, developed chest pain provoked by physical exertion. Described by various biographers as demanding, impatient, and easily irritated, Hunter managed to pace his physical activity to control the angina. Over time, however, the discomfort was provoked by irritation and frustration, and Hunter was unable to control his "turbulent Celtic nature." Like most Type A individuals, he was inclined to explain his anger as an unavoidable response to an unreasonable and incompetent world, stating, "My life is in the hands of any rascal who chooses to tease and annoy me!" The final rascal was a fellow surgeon who, in the fall of 1773, contradicted Hunter during a public debate at St. George's Hospital over the admission of two Scottish students to the training program. Hunter became enraged, left the room, and died instantly in the arms of a colleague (1).

Is it biologically and behaviorally plausible to assume that Hunter's personality, specifically his chronic anger, was a direct cause of his death? Prospective studies of Type A behavior as a risk factor in asymptomatic subjects favor such an assumption. However, studies of patients with diagnosed heart disease remain contradictory, yielding some positive, some negative, and some counter-hypothetical results (2).

Studies of the Type A behavior pattern (TABP) in patients undergoing diagnostic coronary angiography reveal a mixed picture in assessing TABP as a risk factor for coronary artery disease (CAD). This is perhaps not surprising as TABP may exert its effect via mechanisms such as vasospasm, arrhythmogenesis, embolic dislodgement, hemorrhage, or thrombogenesis. In addition, clinical and ethical selection of CAD patients limits the statistical power of these studies to detect association. For example, mixed results have been cited in analogous studies of cigarette smoking and hypertension (3). Furthermore, conceptual problems are introduced when using a control group comprised of patients with "negative" or "minimal" results who may have other psychological disorders (4,5).

Eight studies, each using one or more of the validated measures of TABP, have found a positive relationship between TABP and severity of CAD (6-13). Ten other such studies contradict these data (14-23). Recent studies indicate that aggravation, irritation, anger, and impatience (AIAI) is the most potent Type A feature for predicting CAD severity (11,12,24-29). Although some studies have failed to find a relationship of AIAI to CAD severity (30-34), others suggest that AIAI is a better predictor of CAD severity than hypertension and cigarette smoking and is only a slightly less powerful predictor than cholesterol (3). Other features of TABP, such as expressive verbal behavior (20,28), somatic nonawareness (35), self-involvement (36), low perceived social support (7,37), and high job involvement (21), also appear to predict CAD severity. TABP has also been shown to predict noncoronary atherosclerosis (38-41).

Because no "gold standard" exists for quantifying mental states or traits, accepted psychometric theory requires that new measures be subjected to rigorous testing for validity and reliability (42). A wide variety of psychosocial processes can interfere with accuracy in measuring AIAI. For example, some patients will deny having AIAI (43), and memory for past events is often poor (44). How, then, do we know that a given test mea-
The Jenkins Activity Survey (46) and Life Change Scale (47) are well-known instruments. The KSSF checklist (developed by MWK) is an experimental psychometric instrument. Item coding is rated on a real-time scale (0 = never, 1 = once a year, 2 = several times a year, 3 = once a month, 4 = several times a month, 5 = once a week, 6 = several times a week, 7 = once a day, 8 = several times a day, 9 = constantly). The three scales which can be constructed from the KSSF checklist include AIAI, Depression, and Anxiety. Scale scores are calculated by adding one point for each item meeting or exceeding item norms by one standard deviation (AIAI = 15 items, Depression = 10 items, Anxiety = 25 items) (45). The KSSF checklist is currently being assessed as an alternative to the Jenkins Activity Survey and the Structured Interview for predicting CAD. Alternate-item, split-half Pearson product-moment correlation coefficients for all three scales were significant at P < 0.001: AIAI = 0.876, Depression = 0.612, and Anxiety = 0.846. All three scales of the KSSF checklist covaried with the Life Change Scale at P-values greater than 0.05: AIAI = 0.474, Depression = 0.451, and Anxiety = 0.352. The AIAI and Anxiety scales both correlated with the Jenkins Activity Survey Type A Scale at P < 0.05: AIAI = 0.411 and Anxiety = 0.244.

Analysis

A P-value of < 0.05 was the level of significance used unless otherwise noted.

Patients with no clinically significant lesions (N = 16) were compared to those with at least single vessel disease (N = 45) on the clinical, demographic, and psychometric variables.

Patients with at least one significantly occluded vessel were then divided into single vessel (N = 23) and multivessel (N = 22) groupings. Clinical and demographic variables were compared across these two groups.

Subjects

A total of 154 male patients referred for coronary angiography agreed to participate in this study. Of these patients, 81 (53%) completed part or all of the questionnaires. Twenty of these patients were omitted from the study because of technical reasons or because they had a previous revascularization procedure. To assess the representativeness of the study sample, the 61 patients available for analysis were compared to the 93 patients with incomplete clinical and demographic data (Table 1).

Procedures

Recruitment took place during each patient’s admission for coronary angiography to a Tulsa, OK, community hospital. The study was explained to each patient by a research assistant, consent was obtained, and a brief clinical history was taken. Each patient then received a packet containing instructions with a request to complete and return the questionnaires before discussing them with others. Questionnaires included the Jenkins Activity Survey (46), the Life Change Scale (47), and the patient version of the KSSF checklist. They were asked to complete the questionnaires within several days after the coronary angiography procedure. All patients were sent reminder letters within a week after initial contact, and packets that were returned were received within two weeks of initial contact.

Table 1
Clinical Characteristics of Recipients of Psychometric Forms

<table>
<thead>
<tr>
<th></th>
<th>Nonreturnees (N = 93)</th>
<th>Returnees (N = 61)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td><strong>SD</strong></td>
<td><strong>Mean</strong></td>
</tr>
<tr>
<td>Age (years)</td>
<td>58</td>
<td>11</td>
</tr>
<tr>
<td>Anginal frequency (episodes/year)</td>
<td>486</td>
<td>502</td>
</tr>
<tr>
<td>Packyears of smoking</td>
<td>44</td>
<td>39</td>
</tr>
<tr>
<td>Positive family history*</td>
<td>22 (24%)</td>
<td>14 (23%)</td>
</tr>
<tr>
<td>Patients with myocardial infarctions</td>
<td>45 (48%)</td>
<td>33 (54%)</td>
</tr>
<tr>
<td>Current smokers</td>
<td>41 (44%)</td>
<td>18 (30%)</td>
</tr>
<tr>
<td>History of hypertension</td>
<td>49 (53%)</td>
<td>31 (51%)</td>
</tr>
</tbody>
</table>

*At least one first- or second-degree relative with a history of coronary artery disease before age 55.

Note: None of the comparisons are significant (P < 0.05).

Two board-certified cardiologists, blind to each other’s results and patients’ questionnaire responses, independently conducted angiographic scoring. As about one-third of the patients had previously been under the care of these cardiologists, a complete lack of contact between scorer and subject prior to evaluation cannot be claimed. Scoring involved estimation of degree of occlusion (0% to 100%) in each of 27 coronary vasculature segments as defined by the coronary artery surgery study (CASS) (48) relative to the nearest unoccluded segment. Interobserver agreement on categorization was 72.1% (44 of 61 correct) for the three CAD severity groupings. Discrepancies between the two scorers were resolved by a coin toss. Pearson product-moment correlation coefficients were also determined for each of the 27 coronary vasculature segments between the two cardiologists to assess interobserver agreement. Of the 27 segments, 25 were positive and statistically significant (P < 0.05). The average interobserver correlation coefficient for the 27 segments was 0.723 (standard deviation = 0.329).

Instrumentation

The Jenkins Activity Survey (46) and Life Change Scale (47) are well-known instruments. The KSSF checklist (developed by MWK) is an experimental psychometric instrument. Item coding is rated on a real-time scale (0 = never, 1 = once a year, 2 = several times a year, 3 = once a month, 4 = several times a month, 5 = once a week, 6 = several times a week, 7 = once a day, 8 = several times a day, 9 = constantly). The three scales which can be constructed from the KSSF checklist include AIAI, Depression, and Anxiety. Scale scores are calculated by adding one point for each item meeting or exceeding item norms by one standard deviation (AIAI = 15 items, Depression = 10 items, Anxiety = 25 items) (45). The KSSF checklist is currently being assessed as an alternative to the Jenkins Activity Survey and the Structured Interview for predicting CAD. Alternate-item, split-half Pearson product-moment correlation coefficients for all three scales were significant at P < 0.001: AIAI = 0.876, Depression = 0.612, and Anxiety = 0.846. All three scales of the KSSF checklist covaried with the Life Change Scale at P-values greater than 0.05: AIAI = 0.474, Depression = 0.451, and Anxiety = 0.352. The AIAI and Anxiety scales both correlated with the Jenkins Activity Survey Type A Scale at P < 0.05: AIAI = 0.411 and Anxiety = 0.244.

Analysis

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Patients with no clinically significant lesions (N = 16) were compared to those with at least single vessel disease (N = 45) on the clinical, demographic, and psychometric variables.

Patients with at least one significantly occluded vessel were then divided into single vessel (N = 23) and multivessel (N = 22) groupings. Clinical and demographic variables were compared across these two groups.
Predictive validity was assessed by comparing the four scales of the Jenkins Activity Survey, the Life Change Scale, and the three scales of the KSSF checklist across the single versus multivessel groupings. Sample size limitations did not allow for a breakdown of single versus multivessel patients into risk factor subgroups. Such an analysis would have indicated whether any observed relationship between one of the psychometric variables and CAD severity was mediated by these other factors.

Results

Nonreturnees and representativeness
Clinical and demographic data on patients responding to this study, compared to nonresponders, indicate that a representative sample of male patients undergoing angiography was obtained from the general population at this particular hospital (Table I).

AIAI and CAD severity
Patients with a total absence of, or nonsignificant, CAD displayed higher levels of depression and anxiety and speed and impatience than the group with significant CAD (Table 2). Patients with nonsignificant CAD were younger, had more normal ejection fractions, and had fewer previously diagnosed myocardial infarctions. Regarding risk factor status or psychological well-being, it cannot be assumed that the group with nonsignificant CAD is otherwise similar to the group with clinically significant CAD.

Only current smoking status, not smoking history, proved significant between the single and multivessel groupings. The multivessel group had more current smokers than the single vessel group (Table 3). Among the Jenkins Activity Survey scales, only Job Involvement was significantly different between groups. In the multivessel group, the Life Change Scale was lower and the AIAI scale was higher (Table 4).

Discussion

The results of this study are similar to those of other angiographic series (49) in terms of patient distribution in each CAD grouping. Additionally, no clinical or demographic characteristics distinguished responders from nonresponders. That 47% of the initial participants did not return the questionnaires is worrisome; however, the lack of distinguishable clinical and demographic characteristics among patients as well as the expected frequency of the CAD severity among groupings lead to the assumption that this CAD sample is representative of patients with CAD who are seen at this particular hospital for angiographic studies.

The higher levels of anxiety and depression and speed and impatience observed in patients with normal or nonsignificantly occluded vessels is consistent with previous studies (4,5). The psychological abnormality of these patients may explain some of the negative observations in attempts to associate TABP with CAD (15). Self-reported or observed behavioral and cognitive characteristics, which are expected to distinguish Type A patients from the general population, may be elevated in the control sample for other reasons.

Although other medical conditions may account for the clinical symptoms of patients with normal or nonsignificantly occluded vessels within a coronary angiography setting, the patients' repeated coronary angiography requests suggest the patients' preoccupation with their CAD symptoms. Further research is needed to clarify whether the Type A personality is a direct result of CAD or a predisposing factor for CAD development.
cluded vessels, the results of this study suggest the need for a high index of suspicion for depression and anxiety disorders among these patients. Such disorders are routinely underdiagnosed in medical settings. Two recent studies indicate that depression and anxiety may also be risk factors for CAD (50,51). Thus, in the present study, some patients with chest pain may have been experiencing transient ischemic events such as vasospasm or partial thrombosis in response to emotional arousal.

Analogous to the association of more specific lipid factors, such as total cholesterol versus the low-density/high-density lipoprotein ratio, in predicting CAD endpoints, and in support of recent studies, this study found a correlation of AIAI with CAD severity yet failed to find a similar correlation with a global measure of Type A behavior (12,24-29). The KSSF checklist measure of AIAI predicted CAD severity, but smoking history, educational level, age, ejection fraction, history of myocardial infarction, hypertension, and premature familial heart disease failed to differentiate the single and multivessel groups.

The results of this study also suggest that the Job Involvement scale of the Jenkins Activity Survey and the Life Change Scale may be promising measures of CAD risk and severity in clinically suspect populations. Although other studies have used the Jenkins Activity Survey, only one set of investigators (21) scored and analyzed the Job Involvement scale. Their study also found this scale to be a predictor of CAD (21). The lower levels on the Life Change Scale observed in the multivessel group, combined with higher levels of AIAI and Job Involvement, suggest that the source of stress in these patient is rooted in personality rather than the psychosocial environment. This observation returns the conceptualization of the Type A syndrome to Friedman and Rosenman's original form (52). Individuals whose self-esteem is dependent upon relatively frequent exogenous accomplishments will attempt to cope by overcompensating their time. Such high self-expectations will result in 1) subjectively felt or nonverbally manifest time urgency; 2) preoccupation with perceived task demands; 3) diminished aesthetic, empathic, and intuitive capacities; and 4) chronic AIAI in response to routine barriers to the immediate accomplishment of proximal tasks (52).

As previously noted (45,52,53), the Type A pathogen for CAD seems to be chronic AIAI—whatever its cognitive etiology or justification (54-56). While other emotional states may predispose to other CAD mechanisms such as vasospasm (57,58), AIAI appears to be a more potent predictor of CAD than cigarette smoking or hypertension (3). Assuming the predictive power of AIAI rests in a causal relationship, the psychophysiological mechanism may well be explained in terms of psychoneuroendocrine influences on lipid metabolism (53,59,60). However, smoking relapse (61) and caffeine ingestion (62) are also elevated in this population. The lipid thesis is the position taken by Friedman in recent years (52,63). Diminishing the density of AIAI may be the proximal goal clinicians should pursue. Other Type A characteristics, not directly indicative of AIAI, may be predictors of CAD only because they predispose to AIAI. For example, high levels of job involvement may predispose a person to more rigorous goal-setting and thus frustration. Beliefs such as "the world is a dog-eat-dog place" can exacerbate a high level of job involvement. To the extent that AIAI is being driven by job stress and family stress, therapy to reduce both should be attempted. Other strategies include teaching patients to cope with stress by changing their goals and expectations. Goals that are thought to be unattainable or impossible may be reevaluated for their possible unattainability or impossibility. Patients may benefit from individual therapy to help them understand the meaning of success, failure, and personal worth. While there are no studies that demonstrate the efficacy of therapy in reducing AIAI, there is some evidence that behavioral therapy may be effective in reducing a variety of depressed mood and anxiety symptoms (64-66). Finally, proper recognition of patients who meet the criteria for AIAI may lead to increased clinical suspicion and identification, ultimately leading to improved recovery rates.

Future studies need to be planned so that interventions may be designed for both groups. Ideally, patients who do not meet the criteria for AIAI would be further evaluated for possible psychosocial reasons that may explain their continued psychosocial stress. This is currently being evaluated in postmyocardial infarction population (66,67).

Table 3

<table>
<thead>
<tr>
<th></th>
<th>1 Vessel (N = 23)</th>
<th>2-3 Vessels (N = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>61</td>
<td>58</td>
</tr>
<tr>
<td>Anginal frequency (episodes/year)</td>
<td>377 (10)</td>
<td>590 (12)</td>
</tr>
<tr>
<td>Pack/years of smoking</td>
<td>44 (42)</td>
<td>40 (37)</td>
</tr>
<tr>
<td>Education (3 = some high school, 4 = high school graduate)</td>
<td>3.6 (1.7)</td>
<td>3.9 (2.3)</td>
</tr>
<tr>
<td>Positive family history</td>
<td>5 (22%)</td>
<td>7 (32%)</td>
</tr>
<tr>
<td>Patients with myocardial infarctions</td>
<td>14 (61%)</td>
<td>16 (73%)</td>
</tr>
<tr>
<td>History of hypertension</td>
<td>13 (9%)</td>
<td>14 (64%)</td>
</tr>
<tr>
<td>Current smokers</td>
<td>3 (13%)</td>
<td>9 (41%)*</td>
</tr>
<tr>
<td>Ejection fraction</td>
<td>57 (14)</td>
<td>50 (17)</td>
</tr>
</tbody>
</table>

*P < 0.05.

Table 4

<table>
<thead>
<tr>
<th>Scale</th>
<th>1 Vessel (N = 23)</th>
<th>2-3 Vessels (N = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jenkins Activity Survey:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type A behavior</td>
<td>200 (73)</td>
<td>215 (95)</td>
</tr>
<tr>
<td>Speed &amp; impatience</td>
<td>155 (52)</td>
<td>155 (72)</td>
</tr>
<tr>
<td>Hard-driving competitiveness</td>
<td>130 (33)</td>
<td>134 (40)</td>
</tr>
<tr>
<td>Job involvement</td>
<td>133 (49)</td>
<td>160 (45)*</td>
</tr>
<tr>
<td>Life Change Scale:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life change score</td>
<td>176 (111)</td>
<td>113 (82)*</td>
</tr>
<tr>
<td>KSSF Checklist:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIAI</td>
<td>1.8 (3.1)</td>
<td>4.0 (4.4)*</td>
</tr>
<tr>
<td>Depression</td>
<td>2.2 (1.8)</td>
<td>2.9 (2.3)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>4.7 (5.2)</td>
<td>7.4 (6.4)</td>
</tr>
</tbody>
</table>

*P < 0.05.
illy lead to inaccurately perceiving threats and behaving in a distant or resentful manner. This can provoke anger and resentment in others, ultimately "confirming" the original belief (64,65).

Future studies that intend to address the question of causality, as opposed to identification for routine clinical decision-making, should not use patients with normal angiograms as control groups. Ideally, such control groups should consist of asymptomatic and age-, sex-, and socioeconomically-matched individuals who do not have CAD as confirmed by angiography. For ethical reasons, such a control group is not available. However, a continued search for the most sensitive, objective, and logistically advantageous measures of AAI is warranted. Its treatment in post myocardial infarction patients has already been demonstrated to reduce morbidity and mortality by 36% over 4.5 years (66,67).

Acknowledgments

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References


Neurosymptoms

John L. Korenman

Despite remarkable technical advances in the care of patients with neurologic disease, the clinical diagnosis of specific neurobiologic entities remains the key to prognosis for many patients. Similarly, despite the marked behavioral and interpersonal effects of depression, its true because the clinical neurosurgery, it is known that simple interactions of the variables and pathophysiology.

Cognition, and to a most important consideration of patients. Accordingly, the extent that we know so far about these disease processes has been described by neurosurgeons, radiologists, and other professionals in the field.

The outcomes of patients with neurologic diseases, particularly cognitive dysfunction, symptoms, and the relationship of these symptoms to cognitive function, behavioral and psychological outcomes, and the r}