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Relationship Between Type A Behavior Pattern and Mental and Physical Symptoms: A Comparison of Global and Component Measures

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Although the Type A behavior pattern (TABP) is typically considered a set of distinct components, most studies of TABP have used global measures, which collapse several components into a single index. These measures are inherently multidimensional and, as such, contain several conceptual and methodological problems. In this study, data from 240 executives were used to compare global and component TABP measures as predictors of mental and physical symptoms. Global measures included the Bortner scale, the Framingham scale, and the Jenkins Activity Survey. Component measures were constructed by recombining items from the global measures on the basis of results from previous confirmatory factor analyses (Edwards, Baglioni, & Cooper, 1990). Results indicate that the component measures were superior to the global measures in terms of number of relationships detected, interpretability, and total explanatory power. Implications for research and practice are discussed.

Over the past 30 years, an enormous amount of research has been focused on the role of the Type A behavior pattern (TABP) in the development of psychological and physical illness. TABP is defined as a set of interrelated behaviors reflecting impatience, time urgency, competitiveness, achievement striving, aggressiveness, and hostility (Friedman & Rosenman, 1974; Glass, 1977; Jenkins, Zyzanski, & Rosenman, 1979). Though somewhat mixed, available evidence suggests that TABP is associated with increased illness, particularly coronary heart disease (CHD) (Booth-Kewley & Friedman, 1987; Matthews, 1988).

Although TABP is typically conceptualized in terms of several distinct components, most empirical TABP research has employed global TABP measures, which reflect some mixture of these components (e.g., Bortner, 1969; Haynes, Levine, Scotch, Feinleib, & Kannel, 1978; Jenkins et al., 1979; Rosenman, 1978). Because they collapse multiple components into a single index, these measures are inherently multidimensional and, as such, are prone to several conceptual and methodological problems. For example, the overall interpretation of these measures is confounded because it is impossible to determine the relative contribution of different components to the overall scale score (cf. Burt, 1976; Gerbing & Anderson, 1988; Wolins, 1982). Furthermore, these measures conceal relationships associated with specific TABP components, some of which are stronger predictors of CHD than others (Booth-Kewley & Friedman, 1987; Matthews, 1988). Finally, these measures violate assumptions of widely used statistical techniques derived from classical measurement theory, such as reliability estimation (Hattie, 1985; Novick & Lewis, 1967; Nunnally, 1978), and fail to meet necessary conditions for construct validity (Gerbing & Anderson, 1988). Despite these drawbacks, the vast majority of empirical TABP research is based on global measures of TABP, with little mention of the problems associated with their inherent multidimensionality.

The purpose of this study was to compare the utility of global and component measures of TABP. We used the Bortner scale (Bortner, 1969), the Framingham scale (Haynes et al., 1978), and the Jenkins Activity Survey (JAS; Jenkins et al., 1979) as global measures of TABP. Following the procedure of Edwards, Baglioni, and Cooper (1990a), we recombined items from these measures to construct two sets of TABP component measures, one drawing from each global measure separately, and another drawing from all global measures collectively. We then compared these measures as predictors of mental and physical symptoms, using number of relationships detected, interpretability, and total explanatory power as criteria.

Global and Component Measures of TABP: A Summary of the Evidence

Empirical TABP research has relied almost exclusively on global measures. This is exemplified by three major prospective studies of TABP and CHD initiated in the 1960s and 1970s (French-Belgian Collaborative Group, 1982; Haynes, Feinleib, & Kannel, 1980; Rosenman et al., 1975), in which the Structured Interview (SI; Rosenman, 1978), the Bortner scale (Bortner, 1969), the Framingham scale (Haynes et al., 1978), the JAS (Jenkins et al., 1979), or some combination thereof were

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used. These studies demonstrated modest but significant relationships between global TABP and the prevalence and incidence of CHD, though the relationships were somewhat dependent on age, gender, length of follow-up, and type of CHD. More recent evidence challenges the conclusiveness of these findings, indicating that the relationship between self-report measures of global TABP and CHD is limited primarily to cross-sectional studies, whereas the relationship for the SI is evident in both cross-sectional and prospective studies (Booth-Kewley & Friedman, 1987; Matthews, 1988).

Though component measures of TABP have been used in few studies, the results of several studies suggest that certain components exhibit stronger relationships with CHD than others. Most of these studies have been focused on speed, job involvement, and competitive drive, perhaps because of the availability of scales within the JAS that purportedly measure these components (Jenkins et al., 1979). Cross-sectional studies in which these scales have been used have found significant relationships for speed and competitive drive, but prospective studies have failed to detect these relationships (Booth-Kewley & Friedman, 1987; Matthews, 1988). In several studies, measures of anger, hostility, and aggression have been incorporated, for example, the Spielberger State–Trait Anger Inventory (Spielberger et al., 1985), the anger scales from the Framingham study (Haynes et al., 1978), the Cook–Medley Hostility Inventory (Cook & Medley, 1954), the potential hostility rating derived from the SI (Dembroski, 1978), and the Hostility and Aggression scales from the Buss–Durkee Inventory (Buss & Durkee, 1957). Overall, the results of these studies suggest cross-sectional relationships with CHD for anger and hostility and a prospective relationship for hostility (Booth-Kewley & Friedman, 1987; Matthews, 1988).

In summary, evidence linking global TABP and CHD is inconsistent for self-report measures but fairly robust for the SI. Evidence regarding TABP components is somewhat inconclusive, though a growing number of studies implicate hostility as a critical component in the prediction of CHD. The inconsistent results obtained for global self-report TABP measures are probably due, in part, to the inherent weaknesses of global measures, particularly their ambiguous interpretation and their tendency to conceal relationships associated with specific components. Though the SI also measures global TABP, it differs from self-report global measures because it contains a strong hostility component (Matthews, 1983). Evidence suggests that this component is largely responsible for the association between the SI and CHD (Dembroski, MacDougall, Shields, Petitto, & Lushene, 1978; Dielman et al., 1987; Matthews, Glass, Rosenman, & Bortner, 1977). Unfortunately, relationships associated with components contained within self-report measures of global TABP have been examined in very few studies. Though the JAS scales have been widely used as component TABP measures, recent evidence suggests that these scales are, in fact, multidimensional, and are therefore prone to the same problems as global TABP measures (Begley & Boyd, 1985; Edwards et al., 1990a; Shipper, Kreitner, Reif, & Lewis, 1986). Furthermore, only a limited number of components have been examined in most studies, typically some subset of speed, job involvement, competitive drive, and hostility. In the present study, we extended existing research by constructing unidimensional measures of 15 TABP components obtained from the Bortner scale, the Framingham scale, and the JAS and by evaluating the utility of these measures as predictors of mental and physical symptoms.

Method

Sample

The sample consisted of 756 executives who attended a 6-week summer executive program from 1983 to 1989 at a major graduate business school in the eastern United States. During the program, each executive received a survey containing the Bortner scale, the Framingham scale, the JAS, and various measures of stress, coping, and mental and physical symptoms. Each executive was also invited to participate in a physiological screening in which serum cholesterol, blood pressure, and heart rate were measured. A total of 404 executives returned completed surveys, and of these, 254 provided complete physiological data. Because of the small proportion of female respondents (5.5%) and potential gender differences on the physiological measures, only male respondents were retained for analysis, resulting in a final sample size of 240. Respondents constituting this sample represented 11 principal industries (finance, electronics, petroleum, automotive, banking, consumer goods, food, insurance, telecommunications, textiles, utilities) and held administrative, financial, sales, production, technical, and general managerial positions. Respondents ranged in age from 30 to 62, with an average age of 44, and averaged 19 years of job experience. In terms of age, years of job experience, or any of the self-report measures, the final sample did not differ from respondents who did not provide complete physiological data.

The sample used in this study overlapped somewhat with a sample of 352 executives used in a previous study of the psychometric properties of the Bortner scale, the Framingham scale, and the JAS (Edwards et al., 1990a). The present sample differs, however, because 165 respondents who were either female or who did not provide complete physiological data were dropped and because 53 new respondents from the 1989 class were added. This overlap does not detract from the relevance of the present study because Edwards et al. (1990a) focused exclusively on the psychometric properties of the Bortner scale, the Framingham scale, and the JAS, whereas we used the findings of Edwards et al. (1990a) to explore the relationship between these measures and indices of mental and physical health. Therefore, the present study was designed as an extension rather than a replication of Edwards et al.'s (1990a) study.

Measures

Measures of TABP included the Bortner scale (Bortner, 1969), the Framingham scale (Haynes et al., 1978), and the JAS (Jenkins et al., 1979). The Bortner scale was modified in two minor ways. First, the original response format, consisting of a straight line that respondents marked at the appropriate location, was replaced with an 11-point numerical response format, centered at zero and ascending to 5 in both directions (cf. Cooper & Marshall, 1979). Second, the anchor *satisfied with job* on Item 14 was replaced with *unambitious*, which more clearly represented the polar opposite of *ambitious* and eliminated respondents' potential confusion (Cooper & Marshall, 1979). The original 10-item Framingham scale was used (Haynes et al., 1978). Form C of the JAS was used (Jenkins et al., 1979); this is currently the most widely used version among adults.

Items from the Bortner scale, the Framingham scale, and the JAS were used to construct global and component measures of TABP.

Global measures were obtained by combining items from each measure according to the original recommended procedures. For the Bortner scale, this involved reversing Items 1, 3, 4, 6, 8, 9, and 10 and summing all 14 items (Bortner, 1969). For the Framingham scale, this involved dividing the first 5 items by a constant (thereby converting all items to the same scale) and summing all 10 items. For the JAS (Jenkins et al., 1979), this involved recoding and summing subsets of the original 52 items to obtain the 21-item TABP scale (JAS–AB), the 21-item Speed/Impatience scale (JAS–S), the 24-item Job Involvement scale (JAS–J), and the 20-item Hard-Driving/Competitive scale (JAS–H). Because the JAS–S, JAS–J, and JAS–H each contain multiple dimensions (Edwards et al., 1990a), we considered them global measures for the present investigation, but at a somewhat more specific level than the Bortner scale, the Framingham scale, and the JAS–AB.

Component measures were constructed according to recommendations presented by Edwards et al. (1990a), who used confirmatory factor analysis to identify unidimensional subsets of items within the Bortner scale, the Framingham scale, and the JAS. Two sets of scales were constructed. First, separate sets of subscales were constructed for the Bortner, Framingham, and JAS scales by recombining their respective items. This procedure yielded two subscales each for the Bortner, Framingham, JAS–AB, and JAS–H, three subscales for the JAS–J, and four subscales for the JAS–S. Taken together, these subscales measured six TABP components: speed/impatience, hard-driving/competitive, time pressure, anger/temper, job involvement, and job responsibility.

Next, items from the Bortner scale, the Framingham scale, and the original 52-item JAS were combined to construct scales measuring 15 different TABP components. Like the subscales created separately for the Bortner scale, the Framingham scale, and the JAS, these scales measured hard-driving/competitive, time pressure, anger/temper, job involvement, and job responsibility. However, these scales differ because speed and impatience were separated into two measures, separate measures of hard-driving and competitive were added, and measures of six additional components were provided, including doing many things at once, punctuality, eating fast, putting words in the mouths of others, ambition, and the desire to acquire titles and credentials (for further details, see Edwards et al., 1990a). Thus, in the present study we used 6 global TABP measures, 15 component measures constructed separately for the Bortner scale, the Framingham scale, and the JAS, and 15 component measures constructed by combining items from the Bortner scale, the Framingham scale, and the JAS.

Two aspects of the procedures used to construct the separate and combined component measures require elaboration. First, the JAS coding procedure assigns predetermined values to missing responses. We used these values for the global and separate component measures but not for the combined component measures, for which we used a simple interval coding scheme. As a result, in analyses of the global and separate component measures we used all 240 respondents, whereas in analyses of the combined component measures we omitted 16 respondents who did not provide complete data for the original 52-item JAS, resulting in a sample size of 224. Second, the scoring procedure for the JAS assigns 25 of the original 52 items to more than one scale. As a result, the separate component measures constructed from a given JAS scale often share items with measures of the same component constructed from other JAS scales. Despite this overlap, the separate component measures were useful for the purposes of this study in that they allowed comparisons of global and component measures separately for each JAS scale. This overlap is avoided by the combined component measures, for which we used the original 52 JAS items rather than the 86 recoded items of the four JAS scales.

Outcome measures included serum cholesterol, blood pressure, heart rate, and self-reported anxiety, depression, somatic symptoms, and angina. The decision to focus on outcomes other than clinical manifestations of CHD was guided by three considerations. First, the vast majority of our sample was asymptomatic, having never experienced a major coronary event (myocardial infarction or angina pectoris). Second, recent evidence suggests that the relationship between TABP and CHD is mediated by increased sympathetic and corticosteroid activity, which in turn influences traditional CHD risk factors, such as blood pressure and serum cholesterol (Williams, 1989). This suggests that the common practice of statistically controlling for CHD risk factors in TABP investigations should be replaced with an explicit examination of the relationship between TABP and CHD risk factors. Third, we included in the present investigation measures of TABP components that have received little empirical attention. Therefore, including a broad array of outcome measures provided an opportunity to detect relationships not evident in previous TABP research.

Serum cholesterol was assayed from a fasting blood sample, with total cholesterol fractionalized into high density lipoprotein (HDL), low density lipoprotein (LDL), and very low density lipoprotein (VLDL). Blood pressure and heart rate were measured during a resting period prior to a treadmill endurance test. Anxiety, depression, and somatic symptoms were measured with the corresponding 8-item subscales from the Crown–Crisp Experiential Index (CCEI; Crown & Crisp, 1966). These subscales have been validated against clinical diagnoses (Crisp, Ralph, McGuinness, & Harris, 1978) and have demonstrated adequate reliability (Alderman, Mackay, Lucas, Spry, & Bell, 1983). Self-reported angina was measured with a 7-item scale developed specifically for this study. Respondents rated the degree of chest pain and pressure experienced while walking, climbing stairs, resting, after meals, and during periods of anger and upset. These items were developed through consultation with coronary specialists, who used similar questions to assess angina symptoms among patients.

Analysis

The primary analyses were multivariate multiple regressions (MMRs; Dwyer, 1983; Wilkinson, 1988). MMR is analogous to multivariate analysis of variance (MANOVA) in that it provides a joint test for the prediction of multiple dependent variables, taking the correlations among these variables into account. However, unlike MANOVA, MMR readily incorporates either categorical or continuous variables as predictors.

Three sets of analyses were conducted. First, the relationships between the global TABP measures and the outcome measures were examined. These analyses allowed comparisons with previous research and provided a necessary benchmark for comparing results obtained with the component measures. The second analysis replaced the global TABP measures with the 15 component measures constructed separately for the Bortner scale, the Framingham scale, and the JAS, and the third analysis replaced these measures with the 15 component measures constructed by combining items from the Bortner scale, the Framingham scale, and the JAS. Increments in explanatory power provided by the component measures over the global measures were analyzed with hierarchical MMR. Unless otherwise stated, two-tailed tests of significance were used for all analyses.

Results

Reliability and Intercorrelation of Outcome Measures

Reliability estimates (Cronbach's alpha) and intercorrelations of the outcome measures are presented in Table 1. The reliability of the anxiety scale was fairly high, whereas the reliabilities of the depression, somatic symptoms, and angina scales were modest (reliabilities are not reported for cholesterol, blood pressure, and heart rate because these measures consisted of a single item). Significant positive correlations were found among the anxiety, depression, somatic symptoms, and angina measures. As would be expected, systolic and diastolic blood pressure were positively correlated, and HDL was negatively correlated with LDL and VLDL. The anxiety, depression, somatic symptoms, and angina measures were, for the most part, uncorrelated with cholesterol, blood pressure, and heart rate. The sizable correlations among some of the dependent variables, particularly anxiety, depression, and somatic symptoms, suggest some redundancy. However, previous studies indicate that these measures represent constructs that are correlated but conceptually distinct (Alderman et al., 1983). Furthermore, the MMR analyses used for these measures provide an omnibus test of significance that guards against the potential increase in Type I error introduced by these correlations.

Global TABP Measures

Table 2 presents correlations and reliability estimates for the global TABP measures, scored according to the original procedures. Reliabilities were moderate for the Bortner and Framingham scales, somewhat lower for the JAS–AB and JAS–S, and quite low for the JAS–J and JAS–H. Correlations among the Bortner scale, the Framingham scale, and the JAS–AB ranged from .586 to .697, whereas correlations among the JAS–S, JAS–J, and JAS–H scales were much smaller, ranging from .126 to .164. The Bortner scale, the Framingham scale, and the JAS–AB correlated moderately with the JAS–S and JAS–H and weakly with the JAS–J. These findings are consistent with previous research indicating modest convergence and moderate to low reliabilities for the Bortner scale, the Framingham scale, and the JAS (Byrne, Rosenman, Schiller, & Chesney, 1985; Edwards et al., 1990a; Edwards, Baglioni, & Cooper, 1990b; Haynes et al., 1980; Johnston & Shaper, 1983; Mayes, Sime, & Ganster, 1984; Price & Clarke, 1978).

Many of the correlations among the global TABP measures exceed their corresponding reliability estimates, inviting the theoretically implausible conclusion that these measures correlate more highly with one another than with alternative measures of their respective underlying constructs. However, this conclusion is unwarranted for two reasons. First, coefficient alpha assumes that the items in a measure represent the same domain of content (Cronbach, 1951; Nunnally, 1978). To the extent this assumption is violated, alpha is reduced (Campbell, 1976; Novick & Lewis, 1967). This assumption is clearly violated by the global TABP measures, which collapse conceptually distinct components into a single index. Second, as noted earlier, the scoring procedure for the JAS assigns 25 of the original 52 items to multiple scales, thereby inflating the interscale correlations.

MMR analyses of the global TABP measures and the 10 outcome measures are presented in Table 3. Six models were estimated; in each, the 10 outcome measures were used as dependent variables and one global TABP measure was used as an independent variable. Standardized regression coefficients are reported, which in this case represent simple product-moment correlations (Cohen & Cohen, 1983). The multivariate *F* for each measure corresponds to the relationship between that measure and the 10 outcomes as a set. Significant multivariate effects were found for the Bortner scale, the Framingham scale, the JAS–AB, and the JAS–S. Univariate analyses revealed that the multivariate effect for the Bortner scale was attributable to a positive relationship with anxiety. The Framingham scale and the JAS–S were positively related not only to anxiety but also to depression, somatic symptoms, and angina. The JAS–AB also exhibited positive relationships with anxiety, depression, and somatic symptoms, as well as a positive relationship with VLDL. A significant negative relationship was also found between the JAS–H and HDL, but this relationship must be interpreted with caution because the multivariate effect for the JAS–H failed to reach significance.

An important finding presented by Edwards et al. (1990a) is that the JAS scales contain several items with large negative loadings. These items introduce numerous negative interitem correlations, which drastically reduce reliability estimates for these scales. These items also substantially alter the interpretation of the overall scale scores by cancelling the contribution of similarly worded items with positive loadings. Unfortunately,

Table 1
Descriptive Statistics, Correlations, and Reliability Estimates for the Outcome Measures

Measure	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Anxiety	5.20	2.69	(.744)									
2. Depression	1.78	2.52	.677**	(.530)								
3. Somatic symptoms	4.24	2.44	.557**	.498**	(.623)							
4. Angina	0.51	1.12	.280**	.311**	.506**	(.642)						
5. HDL	46.93	12.89	−.053	−.123	−.134*	−.138*	—					
6. LDL	155.74	37.52	.007	.044	.007	.028	−.106	—				
7. VLDL	25.34	13.86	.078	.046	.112	.139*	−.413**	.077	—			
8. Heart rate	80.53	15.32	.020	−.029	.076	−.008	.040	−.001	.096	—		
9. Systolic blood pressure	132.83	14.79	−.093	−.088	−.096	−.038	.061	.038	.030	.114	—	
10. Diastolic blood pressure	85.44	9.51	.045	.002	−.006	.034	.002	.103	.057	.119	.550**	—

Note. $N = 240$. Reliabilities are in parentheses. Dashes indicate that reliability was not calculated because the scale consisted of a single item. HDL = high density lipoprotein; LDL = low density lipoprotein; VLDL = very low density lipoprotein.
* $p < .05$. ** $p < .01$.

Table 2
Descriptive Statistics, Correlations, and Reliability Estimates for the Bortner Scale, the Framingham Scale, and the Jenkins Activity Survey (JAS)

Scale	*M*	*SD*	1	2	3	4	5	6
1. Bortner	104.73	13.51	(.630)					
2. Framingham	4.18	1.08	.697**	(.663)				
3. JAS–AB	288.35	60.87	.594**	.586**	(.508)			
4. JAS–S	208.26	62.14	.531**	.557**	.559**	(.554)		
5. JAS–J	281.89	32.13	.191**	.177**	.306**	.164*	(.416)	
6. JAS–H	119.64	26.85	.317**	.353**	.502**	.126	.156*	(.256)

Note. $N = 240$. Reliabilities are in parentheses. AB = global Type A behavior scale; S = Speed/Impatience scale; J = Job Involvement scale; H = Hard-Driving/Competitive scale.
* $p < .05$. ** $p < .01$.

this cancellation involves items that are central to the interpretation of each scale (e.g., speed items for the JAS–S, hard-driving/competitive items for the JAS–H). Taken together, these factors hinder the predictive power of the JAS scales beyond that attributable to their multidimensionality. Because the component measures constructed from the JAS scales reversed all items with significant negative loadings, a valid comparison of these measures against their corresponding global measures required reversing items with significant negative loadings in the global measures as well. Results of these analyses are presented in Tables 4 and 5.

Reversing items with significant negative loadings substantially increased the reliability estimates and correlations associated with the JAS scales. In addition, the relationships between the JAS scales and the outcome measures generally increased in absolute magnitude, and several additional significant relationships emerged, including positive relationships between the JAS–S and both VLDL and heart rate, a negative relationship between the JAS–AB and HDL, and a positive relationship between the JAS–H and anxiety.

Separate Component Measures

Table 6 presents correlations and reliability estimates for the 15 component measures constructed separately for the Bortner scale, the Framingham scale, and the JAS. One component subscale exhibited a reliability greater than .70, and 8 of the remaining 14 component subscales exhibited reliabilities greater than .60. Reliabilities for the remaining 6 subscales were marginal at best, with 3 failing to reach .50. Correlations among the component subscales exhibited the expected pattern, with stronger relationships occurring between subscales measuring the same TABP component. Several correlations among the JAS component subscales exceeded the corresponding reliability estimates, even though the items in each subscale adequately represented a single domain of content (Edwards et al., 1990a). Further analyses indicated that these high correlations were attributable solely to the items shared by the JAS component subscales.

MMR analyses of the relationships between the separate component measures and the outcome measures are presented in Table 7. For these analyses, component subscales constructed from the same global TABP measure were included in the same model, thereby providing an estimate of the total explanatory power of each set of subscales and reducing the likelihood of specification error due to the exclusion of correlated but conceptually distinct variables (James, 1980; Pedhazur, 1982). To facilitate comparisons with the global measures, we report semipartial correlations for each TABP component

Table 3
Multivariate Multiple Regression Relationships Between Global Type A Behavior Pattern (TABP) Measures and Outcome Measures

	Outcome measure										
TABP measure	Anxiety	Depression	Somatic symptoms	Angina	HDL	LDL	VLDL	Heart rate	Systolic blood pressure	Diastolic blood pressure	Multivariate *F*
Bortner	.258**	.124	.083	.030	−.068	−.060	.110	.076	.032	.077	2.51**
Framingham	.410**	.222**	.215**	.170**	−.053	−.049	.122	.027	−.046	.055	5.45**
JAS–AB	.265**	.183**	.142*	.037	−.122	.046	.128*	.054	.097	.098	2.75**
JAS–S	.325**	.189**	.304**	.186**	−.093	−.031	.120	.125	.003	.122	4.59**
JAS–J	−.035	.051	−.030	−.105	−.032	.000	−.058	.022	.040	−.022	0.55
JAS–H	.075	.036	.051	.042	−.163**	−.030	.043	.044	−.040	.054	1.07

Note. $N = 240$. Items with negative loadings were reversed. Table entries are first-order correlations. Multivariate *F* ratios indicate the significance of the relationship between each TABP measure and all 10 outcomes as a set. HDL = high density lipoprotein; LDL = low density lipoprotein; VLDL = very low density lipoprotein; JAS = Jenkins Activity Survey; AB = global Type A behavior scale; S = Speed/Impatience scale; J = Job Involvement scale; H = Hard-Driving/Competitive scale.
* $p < .05$. ** $p < .01$.

Table 4
Descriptive Statistics, Correlations, and Reliability Estimates for the Bortner Scale, the Framingham Scale, and the Jenkins Activity Survey (JAS)

Scale	*M*	*SD*	1	2	3	4	5	6
1. Bortner	104.73	13.51	(.630)					
2. Framingham	4.18	1.08	.697	(.663)				
3. JAS–AB	350.04	71.18	.635	.659	(.653)			
4. JAS–S	309.17	75.69	.656	.695	.802	(.716)		
5. JAS–J	364.30	36.64	.305	.308	.430	.359	(.438)	
6. JAS–H	143.38	30.64	.481	.504	.635	.474	.304	(.564)

Note. $N = 240$. Items with negative loadings were reversed. Reliabilities are in parentheses. All correlations are significant at $p < .01$. AB = global Type A behavior scale; S = Speed/Impatience scale; J = Job Involvement scale; H = Hard-Driving/Competitive scale.

and multiple correlations for the combined effect of each set of components. Significant multivariate effects were found for component subscales obtained from the Bortner scale, the Framingham scale, and the JAS–AB, JAS–S, and JAS–H. Inspection of separate component subscales revealed significant effects for the Bortner speed/impatience and hard-driving/competitive subscales, the Framingham time pressure subscale, the JAS–AB speed/impatience subscale, and the JAS–S speed/impatience and time pressure subscales. With few exceptions, the speed/impatience and time pressure subscales were positively related to anxiety, depression, somatic symptoms, and angina. The Bortner hard-driving/competitive subscale was negatively related to somatic symptoms and positively related to VLDL. However, the five other hard-driving/competitive subscales did not exhibit these relationships, perhaps suggesting that the Bortner subscale reflects some unique aspect of this component. The anger/temper subscales from the JAS–S and JAS–H were positively related to anxiety, somatic symptoms, and (in one case) depression, and the JAS–H hard-driving/competitive subscale was negatively related to HDL, but the multivariate effects for these subscales failed to reach significance.

Comparing these results with those obtained for the global measures (after reversing items with negative loadings) revealed several important findings. For example, although the Bortner scale was related only to anxiety, the Bortner component subscales were also related to depression, somatic symptoms, and VLDL. In several cases, these subscales exhibited *opposite* relationships with outcome measures, suggesting one reason why these relationships were not detected for the original Bortner scale. The Bortner subscales also exhibited suppressor effects such that the absolute magnitude of the coefficient linking each subscale to a given outcome increased with the inclusion of the other subscale (Cohen & Cohen, 1983).

Analyses of the Framingham scale revealed that relationships involving the original Framingham scale were primarily attributable to its time pressure component. However, these relationships were somewhat weaker for the Framingham subscales than for the original Framingham, primarily because several items that were highly correlated with these outcomes (i.e., eating fast, preoccupation with work, and dissatisfaction with job performance) were excluded from the component subscales. The Framingham subscales also exhibited opposite relationships with diastolic blood pressure, relationships that were concealed within the original Framingham scale.

Analyses for the JAS–AB revealed that the relationships between the original JAS–AB and anxiety, depression, and somatic symptoms were attributable to its speed/impatience component. In addition, a relationship emerged between the speed/impatience subscale and angina. However, relationships with HDL and VLDL were no longer significant, primarily because

Table 5
Multivariate Multiple Regression Relationships Between Jenkins Activity Survey (JAS) Scales and Outcome Measures

	Outcome measure										
Scale	Anxiety	Depression	Somatic symptoms	Angina	HDL	LDL	VLDL	Heart rate	Systolic blood pressure	Diastolic blood pressure	Multivariate *F*
JAS–AB	.271**	.199**	.189**	.089	−.140*	.031	.143*	.074	.063	.096	2.84**
JAS–S	.377**	.220**	.298**	.138*	−.092	−.019	.145*	.143*	.003	.087	5.38**
JAS–J	.021	−.003	.003	−.085	−.071	.029	−.035	.038	.042	−.039	0.78
JAS–H	.181**	.111	.108	.044	−.146*	−.025	.055	.056	−.023	.058	1.52

Note. $N = 240$. Items with negative loadings were reversed. Table entries are first-order correlations. Multivariate *F* ratios indicate the significance of the relationship between each TABP measure and all 10 outcomes at a set. HDL = high density lipoprotein; LDL = low density lipoprotein; VLDL = very low density lipoprotein; AB = global Type A behavior scale; S = Speed/Impatience scale; J = Job Involvement scale; H = Hard-Driving/Competitive scale.
* $p < .05$. ** $p < .01$.

Table 6
Descriptive Statistics, Correlations, and Reliability Estimates for the Separate Component Type A Behavior Pattern Measures

Measure	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Bortner SI	36.02	7.23	(.573)														
2. Bortner HC	34.39	5.68	.378**	(.694)													
3. Framingham TP	1.90	0.95	.392**	.274**	(.662)												
4. Framingham HC	1.86	0.57	.401**	.662**	.186**	(.684)											
5. JAS–AB SI	86.64	30.49	.515**	.204**	.109	.269**	(.637)										
6. JAS–AB HC	135.47	42.91	.408**	.564**	.265**	.603**	.179**	(.649)									
7. JAS–S SI	137.70	51.06	.557**	.261**	.180**	.309**	.925**	.219**	(.689)								
8. JAS–S HC	41.69	14.19	.376**	.611**	.277**	.623**	.158*	.839**	.218**	(.815)							
9. JAS–S TP	28.67	12.52	.280**	.275**	.342**	.189**	.173**	.202**	.213**	.183**	(.228)						
10. JAS–S AT	31.68	18.71	.239**	.360**	.089	.369**	.246**	.348**	.263**	.313**	.134*	(.667)					
11. JAS–J JI	39.95	13.52	.175**	.250**	.250**	.144*	.048	.165*	.041	.194**	.116	.056	(.457)				
12. JAS–J JR	46.55	8.65	−.017	.087	.034	.039	−.077	.151*	−.063	.129*	.041	.016	.075	(.519)			
13. JAS–J HC	41.50	4.84	.259**	.497**	.107	.523**	.129*	.606**	.148*	.678**	.154*	.175**	.180**	.101	(.353)		
14. JAS–H HC	50.48	18.94	.366**	.526**	.281**	.570**	.202**	.703**	.251**	.629**	.203**	.249**	.219**	.061	.456**	(.698)	
15. JAS–H AT	13.58	6.75	.328**	.327**	.165*	.339**	.265**	.268**	.311**	.267**	.194**	.832**	−.009	.006	.146*	.241**	(.599)

Note. $N = 240$. Reliabilities are in parentheses. SI = speed and impatience component subscale; HC = hard-driving and competitive component subscale; TP = time pressure component subscale; JI = job involvement component subscale; JAS = Jenkins Activity Survey; AB = global Type A behavior scale; S = Speed/Impatience scale; AT = anger/temper component scale; J = Job Involvement scale; JR = job responsibility component subscale; H = Hard-Driving/Competitive scale.
* $p < .05$. ** $p < .01$.

several items that were correlated with these outcomes (i.e., doing many things at once, deadlines at work, and temper) were excluded from the subscales. Separating the JAS–S into its four component subscales revealed that its relationships with anxiety, somatic symptoms, and angina were attributable to its speed/impatience and time pressure components, whereas its relationship with depression was attributable to the anger/temper component. Though the relationships for VLDL and heart rate were slightly larger for the JAS–S subscales than for the original JAS–S, they were no longer significant, primarily because the subscale model included three more predictors but provided little additional explanatory power. Finally, separating the JAS–H into subscales revealed that its relationship with anxiety was attributable to the anger/temper component, whereas its relationship with HDL was attributable to the hard-driving/competitive component. The anger/temper component also exhibited positive relationships with depression and somatic symptoms. Though the results for the JAS–J subscales differed slightly from those obtained for the original JAS–J, multivariate effects for these measures remained nonsignificant.

To determine whether the separate component measures provided additional explanatory power over the global measures, we conducted a series of hierarchical MMR analyses, testing the variance explained by the separate component measures after controlling for their respective global measures. It may seem unlikely that these analyses could yield significant effects, given that the items in the separate component measures are already included in their respective global measures. Our rationale for these analyses was that each global measure implicitly constrains the regression coefficients on its constituent items to be equal. Component measures relax this constraint somewhat, such that the coefficients are equal within the set of items constituting each component measure but may differ across sets. If the coefficients on the component measures are equal to the coefficient on the global measure, then the component measures will explain no additional variance after the global measure is controlled. However, if the coefficients on the component measures differ from the coefficient on the global measure, then the component measures will explain additional variance after the global measure is controlled. Note that, for these analyses, the effects of items excluded from the component measures remain in the global measure and, hence, are held constant.

Results for these analyses are presented in Table 8. We report adjusted multiple correlations, thereby controlling for the number of predictors included in each model. An omnibus test is also reported, comparing all 15 separate component measures to all six global measures. The omnibus test was significant, indicating that the 15 separate component measures explained additional variance after controlling for all six global measures. Analyses for separate sets of global and component measures revealed significant incremental effects for the Bortner and Framingham scales, though the effect for the JAS–AB also approached significance ($p < .065$). Overall, these analyses indicated that, when the excluded items are held constant, the explanatory power of the separate component measures is somewhat larger than that of the global measures. However,

Table 7
Multivariate Multiple Regression Relationships Between Separate Component Type A Behavior Pattern (TABP) Measures and Outcome Measures

TABP measure	Anxiety	Depression	Somatic symptoms	Angina	HDL	LDL	VLDL	Heart rate	Systolic blood pressure	Diastolic blood pressure	Multivariate F
	Outcome measure										
Bortner subscales	.373**	.255**	.261**	.138	.117	.078	.217**	.085	.056	.128	3.29**
Hard-driving/ competitive	−.078	−.097	−.152*	−.095	−.109	−.072	.203**	−.017	.056	−.066	2.53**
Speed/impatience	.367**	.255**	.254*	.128*	.000	.000	−.005	.084	−.025	.126	4.38**
Framingham subscales	.349**	.200**	.164*	.163*	.074	.040	.081	.039	.130	.200*	2.54**
Hard-driving/ competitive	.067	−.016	.012	.000	−.061	−.015	.071	−.010	.060	.155*	1.02
Time pressure	.324**	.198**	.158*	.160*	−.031	−.034	.025	−.035	−.125	−.153*	3.95**
JAS–AB subscales	.301**	.184*	.265**	.165*	.119	.129	.149	.102	.087	.116	2.36**
Speed/impatience	.268**	.138*	.264**	.165*	−.031	−.096	.071	.079	.082	.107	3.39**
Hard-driving/ competitive	.086	.095	−.027	−.019	−.108	.103	.116	.049	.014	.025	1.21
JAS–S subscales	.390**	.228*	.352**	.261**	.148	.095	.172	.146	.121	.178	1.96**
Speed/impatience	.239**	.113	.239**	.164**	−.015	−.077	.067	.085	.052	.110	3.00**
Hard-driving/ competitive	−.055	−.036	−.115	−.114	−.048	.054	.093	.012	.032	.043	0.86
Anger/temper	.141*	.132*	.116	.033	−.023	.034	.010	.058	.000	.046	0.79
Time pressure	.169**	.078	.141*	.151*	−.111	−.002	.069	.045	−.114	−.125	2.06*
JAS–J subscales	.074	.044	.099	.149	.086	.124	.142	.075	.164	.099	0.97
Hard-driving/ competitive	.032	−.008	−.046	−.095	−.084	−.019	.106	.055	.113	.075	1.14
Job involvement	.040	.035	.027	−.046	.006	−.032	.013	.039	.084	.051	0.40
Job responsibility	−.054	.025	−.082	−.082	−.007	.121	−.100	−.004	.038	−.011	1.12
JAS–H subscales	.276**	.196**	.210**	.074	.170*	.004	.062	.115	.017	.062	1.63*
Hard-driving/ competitive	.100	.107	.024	.035	−.165*	.002	.057	.037	−.015	.029	1.10
Anger/temper	.225**	.133*	.196**	.055	.000	−.004	.009	.097	.011	.047	1.76

Note. $N = 240$. Table entries are semipartial correlations for each subscale and multiple correlations for each set of subscales. Multivariate F ratios indicate the significance of the relationship between each subscale (or set of subscales) and all 10 outcomes as a set. HDL = high density lipoprotein; LDL = low density lipoprotein; VLDL = very low density lipoprotein; JAS = Jenkins Activity Survey; AB = global Type A behavior scale; S = Speed/Impatience scale; J = Job Involvement scale; H = Hard-Driving/Competitive scale.
* $p < .05$ ** $p < .01$.

these analyses also revealed that, in some cases, the global measures explained additional variance after their respective component measures were controlled. This was particularly evident for the Framingham scale; the global measure explained additional variance in anxiety, depression, somatic symptoms, and angina. Though these effects seem to provide support for the global measure, we must emphasize that, after the separate component measures were controlled, the coefficient for the global measure simply reflected the influence of the excluded items. Hence, these results indicate that, though some of the excluded items did not convincingly represent TABP components, they were nonetheless correlated with the outcome measures used.

Combined Component Measures

In Table 9, we present correlations and reliability estimates for the 15 component scales constructed by combining items from the Bortner scale, the Framingham scale, and the JAS. Three component scales exhibited reliabilities greater than .70, and 8 of the remaining scales exhibited reliabilities greater than .60. Reliabilities for the remaining 4 scales were rather low, with 3 failing to reach .50. Overall, the highest correlations were between the hard-driving/competitive component scale and the three component scales reflecting similar but more specific content (ambition, competitiveness, hard-driving). Similarly, the speed component scale was positively related to the eating fast, words in the mouths of others, and impatience component scales. The time pressure, job involvement, and anger/temper component scales exhibited several significant correlations with other component scales, particularly the hard-driving, ambition, hard-driving/competitive, and speed component scales. Note that, because these scales shared no items, none of their intercorrelations exceeded the corresponding reliability estimates.

We also conducted MMR analyses of the relationships between the combined component measures and the outcome

Table 8
Comparison of Global Type A Behavior Pattern (TABP) Measures and Separate Component TABP Measures

TABP measure	Anxiety	Depression	Somatic symptoms	Angina	HDL	LDL	VLDL	Heart rate	Systolic blood pressure	Diastolic blood pressure
Bortner scale										
Global	.249	.105	.055	.000	.000	.000	.089	.045	.000	.045
Component	.363	.239	.245	.105	.071	.000	.197	.000	.000	.089
Global and component	.359[a]	.235[a]	.239[a]	.084	.063	.000	.228[a]	.000	.000	.084
Framingham scale										
Global	.406	.212	.205	.158	.000	.000	.105	.000	.000	.000
Component	.338	.179	.138	.134	.000	.000	.000	.000	.095	.179
Global and component	.473[a]	.290[a]	.239[a]	.190	.000	.000	.095	.084	.071	.192[a]
JAS–AB										
Global	.266	.192	.179	.063	.122	.000	.130	.032	.000	.071
Component	.288	.161	.249	.138	.077	.089	.118	.045	.000	.071
Global and component	.300[a]	.184	.286[a]	.122	.110	.063	.100	.032	.000	.045
JAS–S										
Global	.377	.214	.293	.122	.063	.000	.130	.126	.000	.055
Component	.366	.190	.330	.228	.071	.000	.114	.071	.000	.122
Global and component	.390	.212	.327[a]	.293[a]	.063	.000	.095	.032	.000	.114
JAS–J										
Global	.000	.000	.000	.055	.032	.000	.000	.000	.000	.000
Component	.000	.000	.000	.100	.000	.055	.089	.000	.122	.000
Global and component	.000	.000	.000	.077	.000	.000	.095	.000	.155[a]	.126
JAS–H										
Global	.173	.095	.089	.000	.130	.000	.000	.000	.000	.000
Component	.261	.173	.190	.000	.145	.000	.000	.071	.000	.000
Global and component	.253[a]	.182[a]	.179[a]	.000	.126	.000	.000	.045	.000	.000
All global measures	.424	.217	.326	.184	.100	.000	.000	.110	.077	.000
All separate component measures	.461	.274	.354	.261	.000	.000	.169	.000	.149	.180
All global and separate component measures	.504[a]	.329[a]	.371	.316[a]	.000	.000	.195	.000	.126	.182

Note. $N = 240$. Table entries are adjusted multiple correlations. HDL = high density lipoprotein; LDL = low density lipoprotein; VLDL = very low density lipoprotein; JAS = Jenkins Activity Scale; AB = global Type A behavior scale; S = Speed/Impatience scale; J = Job Involvement scale; H = Hard-Driving/Competitive scale.
[a] For this outcome, the set of component measures explained additional variance after the respective global measure was controlled ($p < .05$).

measures, using all 15 scales as predictors (see Table 10). The overall effect for the model was significant, which was primarily attributable to significant effects for the eating fast, hard-driving, speed, and time pressure component scales and to a marginally significant effect for the competitive component scale. Inspection of individual coefficients revealed that the eating fast component scale was positively related to angina and VLDL. In contrast, the speed component scale was negatively related to VLDL and positively related to anxiety and depression. The time pressure component scale was positively related to anxiety as well as to somatic symptoms and angina, but it was negatively related to diastolic blood pressure. The hard-driving component scale was negatively related to somatic symptoms, and the competitive component scale was negatively related to anxiety, HDL, and LDL. Overall, the combined component measures explained the greatest proportion of variance for anxiety, depression, somatic symptoms, angina, HDL, and diastolic blood pressure.

Comparing these results with those obtained for the global measures (after reversing items with negative loadings) and the separate component measures revealed several important findings. For example, the relationship between somatic symptoms and the speed/impatience components contained within the Bortner, JAS–AB, and JAS–S scales was apparently attributable to hurrying the speech of others. In contrast, the relationship between angina and the speed/impatience components was attributable to eating fast, and the relationships between anxiety and depression and the speed/impatience component scales were due to a general speed factor. Furthermore, after controlling for components associated with speed, impatience provided no unique explanatory power.

The negative relationship between HDL and the hard-driving/competitive component subscale of the JAS–H was apparently attributable to the ambition and competitive components. However, the relationship between VLDL and the hard-driving/competitive component subscale of the Bortner scale was not evident in the associated component measures. Further analyses revealed that, individually, the hard-driving, competitive, and hard-driving/competitive measures were each positively related to VLDL, and that, as a set, these measures were marginally related to VLDL after the remaining combined component measures were controlled ($p < .09$). Hence, the absence

Table 9
Descriptive Statistics, Correlations, and Reliability Estimates for the Combined Component Type A Behavior Pattern Measures

Measure	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Doing many things at once	22.56	5.51	(.448)														
2. Punctuality	13.47	4.24	−.085	(.639)													
3. Eating fast	24.49	10.43	.190**	.158*	(.858)												
4. Putting words in the mouths of others	17.61	6.32	.163*	.042	.293**	(.693)											
5. Impatience	16.91	8.18	.034	.055	.196**	.242**	(.661)										
6. Ambition	37.41	6.98	.331**	−.008	.242**	.151*	.102	(.674)									
7. Competitiveness	15.14	3.42	.182**	.056	.070	.177**	.021	.294**	(.611)								
8. Hard-driving	21.52	5.66	.288**	−.042	.318**	.238**	.250**	.537**	.385**	(.683)							
9. Speed	35.43	10.97	.259**	.055	.374**	.424**	.391**	.294**	.174**	.384**	(.652)						
10. Hard-driving/competitive	27.70	7.63	.317**	−.074	.246**	.187**	.117	.534**	.560**	.603**	.310**	(.783)					
11. Time pressure	32.91	11.44	.301**	−.133*	.124	.126	.228**	.294**	.069	.432**	.409**	.282**	(.619)				
12. Job involvement	38.05	8.96	.202**	−.099	.073	.131*	.167*	.323**	.152*	.414**	.225**	.228**	.382**	(.512)			
13. Anger/temper	18.71	7.72	.138*	.035	.226**	.316**	.346**	.293**	.341**	.414**	.414**	.461**	.153*	.217**	(.707)		
14. Job responsibility	27.94	4.41	.104	−.033	−.089	−.026	.005	.064	.028	.104	−.012	.088	.105	.114	−.023	(.479)	
15. Desire for titles/credentials	31.01	7.26	.155*	−.145*	.223**	.019	.034	.199**	.158*	.159*	.114	.223**	−.002	.208	.202	−.128	(.328)

Note. $N = 240$. Reliabilities are in parentheses.
* $p < .05$. ** $p < .01$.

of significant relationships between these measures and VLDL reflects the lack of *unique* explanatory power for each measure after the other measures and other correlates of VLDL (e.g., eating fast) were controlled.

Relationships involving the time pressure components of the Framingham scale and the JAS–S were reflected in the combined time pressure component measure. In contrast, relationships between the anger/temper component subscales of the JAS–S and JAS–H and the outcomes of anxiety, depression, and somatic symptoms did not emerge. However, these relationships were evident when the anger/temper component measure was analyzed separately, suggesting that its explanatory power had been diminished by the inclusion of other components.

To examine the increase in explanatory power provided by the combined component measures, we again used hierarchical MMR, testing the increment in variance explained by the combined component measures after controlling for either the six global measures or the 15 separate component measures (see Table 11). Both comparisons yielded significant results, reflecting greater explained variance than the global measures for four outcomes and greater explained variance than the separate component measures for two outcomes. However, two caveats regarding these results should be noted.

First, when used with the combined component measures, the hierarchical procedure cannot be interpreted in the same manner as before. With the separate component measures, this procedure indicated the increase in variance explained by these measures when the excluded items were held constant. This interpretation was possible because the separate component measures consisted of subsets of the items constituting the global measure. This is not the case with the combined component measures, in which items were combined across different global measures and which were based on the original 52 JAS items rather than the 86 recoded items constituting the four JAS scales. Hence, these results simply indicate that the combined component measures explained additional variance beyond that explained by either the global or separate component measures.

Second, after the combined component measures were controlled, the global measures explained additional variance in several outcomes. As before, this reflects the influence of the items excluded from the combined component measures, some of which were correlated with the outcome measures.

Discussion

The results of this study indicate that component TABP measures provide three major advantages over global measures. First, whereas the global measures exhibited very few significant relationships with outcomes, component measures *based on the same items* exhibited many significant relationships. This was particularly true for the Bortner and Framingham scales, which contained components that exhibited *opposite* relationships with outcomes. Second, significant relationships obtained for component measures were more readily interpretable in that, unlike global measures, they more convincingly represented a single, unidimensional construct. For example, the relationships observed for the original Framingham scale can-

Table 10
Multivariate Multiple Regression Relationships Between Combined Component Type A Behavior Pattern (TABP) Measures and Outcome Measures

TABP measure	Outcome measures										Multiple F
	Anxiety	Depression	Somatic symptoms	Angina	HDL	LDL	VLDL	Heart rate	Systolic blood pressure	Diastolic blood pressure	
All component measures	.518**	.346*	.428**	.344*	.342*	.269	.315	.219	.271	.332*	1.69**
Doing many things at once	.023	.104	.090	−.007	−.155*	.060	−.017	.030	−.085	.015	1.51
Punctuality	.110	.082	.056	.051	.074	−.014	.031	.041	.041	−.043	0.88
Eating fast	−.016	−.010	.109	.172**	−.020	.000	.141*	.117	−.057	.070	2.04*
Putting words in the mouths of others	.075	−.007	.150*	.090	−.031	−.066	−.040	.029	.119	.095	1.59
Impatience	.013	−.030	−.029	−.054	−.008	−.014	.092	.045	.066	.180**	1.13
Ambition	.035	−.025	−.035	−.008	−.181**	−.041	.016	−.006	.024	.084	1.51
Competitive	−.131*	−.060	−.069	−.051	−.132*	−.135*	.080	−.076	.044	−.012	1.75
Hard-driving	−.035	−.020	−.180**	−.033	.109	−.084	.060	−.011	.058	−.079	2.22*
Speed	.195**	.182**	.068	−.105	.085	.054	−.128*	−.062	.023	−.073	3.01**
Hard-driving/competitive	−.020	−.022	.018	−.050	.044	.180**	.054	.015	.011	.066	1.21
Time pressure	.179**	.085	.165**	.229**	−.084	−.071	.000	−.041	−.119	−.152*	2.87**
Job involvement	.041	−.002	.037	−.121	.067	.028	.080	.071	−.055	−.060	1.29
Anger/temper	.083	.060	.062	.069	.004	.031	−.059	.070	−.073	.008	0.69
Job responsibility	−.071	.016	.046	.030	−.000	.098	−.076	.005	.104	.045	.96
Desire for titles/credentials	−.013	.006	.042	.010	.060	−.028	−.099	−.043	.032	−.042	.53

Note. $N = 224$. Table entries are semipartial correlations for each component scale and multiple correlations for each set of component scales. Multivariate F ratios indicate the significance of the relationship between each component scale (or set of scales) and all 10 outcomes as a set.
* $p < .05$. ** $p < .01$.

not be unambiguously attributed to hard-driving/competitiveness, time pressure, or some combination thereof. In contrast, results for the component measures derived from the Framingham scale indicate that these relationships are attributable almost entirely to time pressure. Similarly, separating the JAS–S into its constituent components revealed that its relationships with the outcome measures could be attributed not only to speed/impatience but also to anger/temper and time pressure. Third, the component measures provided additional explanatory power over the global measures. These results were obtained even though the separate and combined component measures contained only 58 and 56 items, respectively, rather than the 110 items in the global measures. The combined component measures also provided increases in explanatory power over the separate component measures, but these gains were notably smaller than those obtained over the global measures. Hence, the major increases in explanatory power were attributable to the use of either the separate or combined component measures, with only minor increases obtained by using the combined component measures instead of the separate compo-

Table 11
Comparison of Global Type A Behavior Pattern (TABP) Measures, Separate Component TABP Measures, and Combined Component TABP Measures

TABP measure	Anxiety	Depression	Somatic symptoms	Angina	HDL	LDL	VLDL	Heart rate	Systolic blood pressure	Diastolic blood pressure
All global measures	.424	.217	.326	.184	.100	.000	.000	.110	.077	.000
All separate component measures	.454	.277	.352	.276	.000	.000	.071	.000	.145	.179
All combined component measures	.468	.247	.358	.244	.240	.101	.197	.000	.107	.225
All global and combined component measures	.522[a]	.297	.386[a]	.295[a]	.286[a]	.158	.179	.000	.055	.190
All separate and combined component measures	.499[b]	.279	.362	.305	.249[b]	.141	.182	.000	.161	.239

Note. $N = 224$. Table entries are adjusted multiple correlations. HDL = high density lipoprotein; LDL = low density lipoprotein; VLDL = very low density lipoprotein.
[a] For this outcome, the 15 combined component measures explained additional variance after the six global measures were controlled ($p < .05$). [b] For this outcome, the 15 combined component measures explained additional variance after the 15 separate component measures were controlled ($p < .05$).

nent measures. However, some of the items excluded from the separate and combined component measures were related to the outcome measures used. Because these items do not convincingly represent TABP components (Edwards et al., 1990a), these results apparently represent factors outside the domain of TABP. Hence, given the number of relationships detected, their interpretability, and the total explanatory power, the component TABP measures used in this study seem generally superior to the corresponding global measures.

The implications of this study for TABP research follow directly from the conclusions stated above. First, separating existing global measures into their constituent components may reveal previously undetected relationships. For example, the relationship between global TABP measures and serum cholesterol is often weak and inconsistent, particularly for self-report measures (e.g., Caplan, Cobb, French, Harrison, & Pinneau, 1980; Haynes et al., 1978; Shekelle, Schoenberger, & Stamler, 1976; Shipper et al., 1986). The present study suggests that components reflecting ambition, drive, and competitiveness may exhibit negative relationships with HDL and, to a lesser extent, positive relationships with VLDL, both of which would increase CHD risk. Unfortunately, it difficult to evaluate the biological plausibility of these effects because of the paucity of studies examining the psychological correlates of cholesterol, particularly HDL, LDL, and VLDL (van Doornen & Orlebeke, 1982). Previous research has also failed to demonstrate a consistent relationship between TABP and either blood pressure or heart rate (Myrtek & Greenlee, 1984). Although blood pressure and heart rate were unrelated to global TABP in the present study, diastolic blood pressure was positively related to impatience and negatively related to time pressure. However, assuming that impatience and time pressure may each produce sustained sympathetic arousal, it follows that both components ought to exhibit positive relationships with diastolic blood pressure. Further research incorporating measures of these mediating mechanisms is needed to clarify this apparent anomaly.

The relationship between global TABP and depression has also been inconsistent, with some researchers finding a positive relationship (Chesney, Black, Chadwick, & Rosenman, 1981; Dearborn & Hastings, 1987), others finding a negative relationship (Burke & Weir, 1980), and others finding no relationship (Brief, Rude, & Rabinowitz, 1983; Caplan et al., 1980). This inconsistency may be due to the confounding of speed with hard-driving/competitiveness which exhibited opposite relationships with depression in the present study. Though the weak negative relationship for hard-driving/competitiveness is consistent with previous research demonstrating motivational deficits associated with depression, the positive relationship for speed is inconsistent with previous research (Garber, Miller, & Abramson, 1980). Perhaps this relationship reflects the pursuit of unattainable goals, which may generate accelerated but misdirected behavior, a sense of time pressure, and ultimately depression. Again, further research is needed to clarify these processes and resolve these inconsistencies.

A second implication of the present study is that, when global TABP measures are separated into their constituent components, existing relationships involving TABP may be clarified. For example, self-report measures of TABP are often related to anxiety (Chesney et al., 1981; Frew & Bruning, 1987; Haynes et al., 1978; Matteson & Ivancevich, 1982; Somes, Garrity, & Marx, 1981). The present study suggests that this relationship is primarily attributable to components reflecting speed and time pressure. This finding is consistent with previous research, which indicates a positive association between anxiety and activity levels (Garber et al., 1980). Similarly, global TABP has exhibited a modest relationship with angina (Booth-Kewley & Friedman, 1987). Our results implicate eating fast and time pressure as primary contributing components. These results are consistent with earlier research demonstrating a positive association between workload and angina (Jenkins, 1971) in that excessive workload may create a sense of time pressure and require a hastening of certain activities (e.g., eating), which may stimulate sustained sympathetic arousal and, ultimately, promote the development of CHD. Other relationships involving global TABP may be similarly clarified by reanalysis after the separation of global measures into their constituent components.

A third implication is that global TABP measures probably underestimate the true effect of TABP on symptomatology. Recent meta-analyses indicate that global TABP measures rarely explain more than 2% of the variance in disease outcomes (Booth-Kewley & Friedman, 1987). This is consistent with the adjusted squared multiple correlations obtained in the present study, which indicated that the six global TABP measures explained an average of 1.59% of the variance in outcomes. In contrast, analogous results for each set of separate component measures indicated that they explained an average of 2.21% of the variance in outcomes. Similarly, when all six global TABP measures were used in a single model, adjusted squared multiple correlations indicated an average of 3.95% explained variance in outcomes. However, analogous results for the component measures indicated that, when used in a single model, the 15 separate component measures explained an average of 5.41% of the variance in the outcomes, and the combined component measures explained an average of 6.36% of the variance in the outcomes. Taken together, these results indicate that the use of component TABP measures may increase the proportion of explained variance in health outcomes by approximately 50%.

The results of this study also suggest several practical implications. First, interventions to modify TABP behavior should avoid attempts to simultaneously alter all TABP components and instead target specific TABP components, depending on the desired outcome (cf. Roskies, 1980). For example, mental health interventions may require changes in components associated with speed, whereas CHD risk (e.g., cholesterol) interventions may require changes in components associated with competitive drive. Second, the improvements in mental and physical health resulting from TABP interventions may be greater than initially believed. This follows directly from the apparent underestimation of the effects of TABP on health, as evidenced by the increased explanatory power associated with component measures. Though these increases were modest in absolute magnitude, it should be emphasized that they were achieved by simply recombining items from existing measures. Given the potential health consequences of TABP, it seems that the minimal cost and effort entailed by the use of component measures are easily justified. Of course, these implications are very tentative, in that they presume causal relationships between TABP components and outcomes and generalizability of these results to other samples, neither of which can be verified with our data. Further research is clearly needed to replicate the component relationships found in the present study and to demonstrate causal relationships between these components and outcomes of interest.

Several limitations of the present study should be noted. First, we relied on cross-sectional data which, as noted previously, makes it impossible to rule out alternative causal explanations for the observed relationships. For relationships involving physiological outcomes, reverse causality is unlikely, though it is certainly possible that both TABP and physiological outcomes are influenced by some third variable, such as stress or maladaptive coping. However, for relationships involving psychological outcomes, reverse causality is much more plausible. For example, trait anxiety may generate impatient and hurried behaviors, and chronic depression may inhibit competitive and ambitious behaviors. Our view is that these relationships are probably bidirectional, with TABP and mental health exerting mutual effects on one another. Research in which both TABP and various outcomes are repeatedly measured over time, may help clarify the nature of these relationships.

A second limitation concerns the quality and comprehensiveness of the TABP component measures used. These measures often exhibited rather modest reliabilities and, as a set, did not operationalize certain important TABP components, most notably hostility. These deficits emerged primarily because the component measures used in this study were constructed post hoc with items from widely used self-report global measures. Though this strategy provided results that are readily comparable with existing TABP research, it does not guarantee measures with adequate psychometric properties. For future research, measures need to be developed that convincingly operationalize relevant TABP components and demonstrate adequate reliability, validity, and unidimensionality.

A third limitation is the simplistic causal structure underlying the analyses of the TABP components. This is best exemplified in the analysis of the 15 combined component measures, which focused only on the direct effects of these components, leaving the 105 correlations among the components unanalyzed. As a result, simple correlations between these components and outcomes, many of which were significant, could not be fully decomposed. It is quite likely that correlations among the TABP components may involve causal relationships. For example, a hard-driving and competitive approach to work may result in setting unreasonably high goals, which may increase perceived time pressure and accelerate work behaviors. Unfortunately, available research provides little information regarding the effects of TABP components on one another, making it difficult to specify more complex causal structures. In future research, causal relationships among TABP components should be identified, thereby providing the necessary basis for clarifying the total effects of TABP components.

A fourth limitation is that several of the dependent variables and all of the independent variables were based on self-report measures. This strategy introduces common method variance, which may have inflated the correlations among these measures. However, this bias does not affect the comparison between global and component measures, for which method of measurement was held constant. Furthermore, differences between the global and component measures were found for both self-report and physiological dependent variables, suggesting that the obtained results were not contingent on method of measurement.

A final limitation was the use of a single nonrepresentative sample of 240 respondents. Although this sample represents a variety of job and industry types, it was obtained by convenience sampling and, hence, does not permit generalizations to the larger population of working adults. In addition, despite the use of multivariate procedures to guard against Type I error, a large number of statistical tests were conducted on a sample of moderate size. Because additional samples were not available for cross-validation, the results of this study must be considered truly exploratory. Furthermore, some of the results reported, such as the suppression effects found for the Bortner subscales, often do not survive cross-validation and, therefore, must be considered tentative. Additional research using large representative samples is clearly needed to verify the results obtained in this study.

In conclusion, the present study demonstrates several major advantages of component over global measures of TABP. Therefore, we suggest that global TABP measures should be abandoned in favor of component measures. If necessary, these measures may be constructed by recombining items from existing global measures. However, a far superior strategy would be to develop new TABP component measures by carefully defining the components of interest, constructing items that convincingly represent their corresponding content domains, and verifying the psychometric properties and hypothesized underlying structure of the resulting measures. The use of such measures in empirical research ought to greatly enhance understanding of the effects of TABP on mental and physical symptomatology.

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