The Personality Assessment System as A Conceptual Framework for the Type A Coronary-Prone Behavior Pattern

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Freidman and Rosenman, like other cardiac researchers in the 1950's, were investigating the role of diet, smoking, blood pressure, and other traditional risk factors in the etiology of coronary heart disease (CHD). They had also noted, however, the presence of certain psychological traits in the majority of their young and middle aged coronary patients. Their willingness to look at coronary illness from a nonmedical perspective led to a formal identification of the Type A, coronary-prone behavior pattern (CPBP) in 1959. Using 3,000 employed men from the San Francisco area as subjects, Freidman and Rosenman began a program of prospective research to identify the components believed to be associated with enhanced risk of CHD. Clinical observations of coronary risk patients had suggested some possible characteristics: "hurry sickness"-an unremitting struggle with the limits of time itself, and an obsession with counting. The numerical yardstick was explained as the attempt to appease a "fundamental insecurity" apparent in the Type A male who, in the absence of an intrinsic sense of self-worth, sought to secure status in the eyes of others by accumulating the "maximal number of achievements in a minimal amount of time." The inevitable result was a struggle against not only time,but against other persons as well, leading to hostility and aggression in interpersonal contacts. As many stress researchers have pointed out, however, a struggle is a struggle, in terms of the physiological consequences to the individual (Freidman, 1969).

Subsequent research identified three critical factors of this "action-emotion complex": excessive competitive striving, time urgency, and aggressiveness. Type B was defined as the relative absence of these characteristics (Freidman & Rosenman, 1974). Data supported the association of Type A behavior with increased incidence of CHD for the young and middle aged males in their sample (Freidman, 1969), independent of other known risk factors, such as hypertension or smoking (Rosenman, 1974,1975). The prospective research provided initial support for the construct. Additional retrospective research in the early 1970's verified the association of Type A behavior with cardiovascular pathology in samples of males representing various geographic regions and occupations (Blumenthal, Williams, Kong, Thompson, Jenkins, & Rosenman,1975; Jenkins, Rosenman, & Zyzanski, 1974; Rosenman, 1975).

Research on the three critical factors (competitive striving, aggressiveness, and

description of the Type A construct as a normally distributed individual difference variable.

Description of the Construct

Competitive striving. A series of studies by Glass and his colleagues suggested that A's and B's differ in their orientation toward competitive achievement (Burnam, Pennebaker, & Glass, 1975; Glass, 1977; Krantz, Glass, & Snyder, 1974). A frequently cited study by Carver, Coleman, and Glass (1976) is a good illustration. On a treadmill, male and female college students, classified as A or B, differed in both effort expended during a physically strenuous task and subjective ratings of fatigue. Type A's performed closer to the limits of their endurance and were more likely than their Type B counterparts to suppress feelings of fatigue, even though they should have been more tired than the B's. Glass (1977) observed that differences could be understood as increased motivation of Type A's to gain and maintain control over events in their immediate environment. He also suggested that these differences might only be apparent under condition of ego threat. Mathews and Brunson (1979) found that Type A's focused their attention on events defined as central to performance, while appearing to actively inhibit attention to peripheral events. Pursing the allocation of attention notion, Stern, Harris, and Elverum (1981) found that Type A's were as likely as type B's to recall cues related to fatigue and mood when such cues were defined as important to the task.

In samples including males and females, sex differences have occasionally appeared, and a scattering of the studies have also suggested that A/B differences might be enhanced with increasing age.

Aggressiveness and Hostility. In two studies A's were found to be more aggressive in response to frustration, but both A's and B's responded with aggression to interpersonal provocation (Carver and Glass, 1978). Several other experiments have been generally consistent with the idea that Type A's overreact to provocation, apparently due to perceived threats of loss of control (Fitz and McLaughlin, 1979; Van Egeren, 1979 b). Sex differences and age have been inconsistent.

Time Urgency. The third factor, a sense of time urgency or impatience, has most frequently been operationalized as the estimation of elapsed time for intervals of short duration. Using 60 second intervals with time estimation as the primary task, Bortner and Rosenman (1967) demonstrated that Type A's estimates of the passage of time were faster than were estimates made by Type B's, suggesting that Type A's perceived time as passing more slowly. Burnam et al. (1975) also used a 60 second interval, but subjects were required to read a technical report during the estimation process. Price (1978) employed 12, 60, 90, 110, and 135 second intervals, crossed with three different treatment conditions, two involving cognitive interference. Significant effects were noted only in noninterference 135 second intervals. Yarnold and Grimm (1982) replicated Burnham et al. (1975) for 60 second intervals and reported no effect for differential reading rates, age, or race in a sample of female undergraduates.

Retzlaff (1982) found no differences with short or very long intervals. Different indices of time of urgency have also supported A/B differences. Gastoff (1980) demonstrated that Type A's arrived at scheduled

male and female undergraduates, reported that A's worked significantly faster in a task when no time constraints were specified. Sex had no significant effect. Price reported A's reaction times to be slower when the task required the slowing down of activity.

Task involvement during time estimation appears to be an important factor (Burnam et al., 1975), and these findings are consistent with the notion suggested by Mathews and Brunson (1979) of differences in allocation of attention. The lack of consistency in the results may also attribute to variations in the time intervals employed. None of the studies found faster estimates for Type B's, and many results have suggested a tendency for A's to perceive time as passing more slowly than do B's. No correlation for either sex have beennoted for time estimation. Though effects for ego threat have not been tested, this factor does not logically relate to time estimation. Further investigation of the impact of variations in interval duration and the effects of different kinds of cognitive interference on A/B time estimation appears to clarify the nature of the time urgency component in coronary prone behavior.

Summary. Though this review is not intended to be comprehensive, the studies reported are representative of the personality research in CPBP. Of these three factors converging in the Type A pattern, competitive striving has consistently emerged as a prominent characteristic. The interaction of competitiveness with environmental conditions has also been addressed. Time urgency has received less attention, and the results have been suggestive but not entirely consistent across studies. Hostility or aggressiveness has been studied less extensively as well.

Measurement of Type Behavior

The CPBP has been operationalized in several ways since identification of the clinical syndrome. The earliest objective assessment tool was the Structured Interview (SI), developed for the use with Rosenman, Freidman, Straus, Wurm, Kositchek, Hahn, and Werthessen, (1964) sample of middle aged working males. Items are administered orally, under deliberately stressful or provocative conditions. This provides additional behavioral measures of the construct. Speech stylistics are an important component as well (Glass, 1977), The SI has also been used to create subdivisions of Type A (Jenkins, Rosenman, and Freidman, 1968).

Jenkins (1966) constructed the Jenkins Activity Survey for Health Prediction (JAS), an objective self-administered questionnaire based on the item content of the SI. A computer scored version soon followed (Jenkins, Zyzanski, and Rosenman, 1971). Factor analysis yielded three factor scales, assumed to represent basic qualitative differences between A and B subjects. The three factors, hard driving, job involvement, and speed/impatience, have become the commonly accepted description of CPBP in personality research (Jenkins et al., 1971). Test re-test reliability coefficients for the JAS have ranged from .66 to .70 for intervals ranging from one to four years (Jenkins, 1978). The JAS has also been validated against actual coronary disease. Using simple unit and optimal weight scoring, 73% of new coronaries in a large sample of middle aged males were correctly identified. New coronary patients scored significantly higher than non-coronaries on the hard driving factor. Though actually less job involved, pre-

sumably due to recent hospitalization for serious illness, nonsignificant but high scores were also noted for impatience (Jenkins et al., 1971).

Krantz et al. (1974) modified the job related content of the JAS and derived Form T, the student version. In practice, A/B classification most often involved dividing a sample at the median, usually a score if 7 or 8 out of the 21 items which contribute to the score (Glass, 1977). Though little information exists regarding reliability, Glass (1977) reported test re-test coefficients of .90 for periods ranging from two week s to four months. Factor analysis of Form T has yielded two factors, hard driving and impatience (Glass, 1977).

The JAS has proven more reliable and more cost effective than the SI, and it has been a valid indicator of the presence of CHD. Form T was designed for use in personality research with younger populations and has not been validated against future coronary disease, but it is quite similar to Form B and has become one of the most commonly used measures of the personality construct in the literature (Glass 1977).

Physiological and Cognitive Studies

Van Egeren (1979a, 1979b) found an acceleration of heart rate in Type A subjects in response to a competitive game opponent. Van Doornen (1980) found a correlation of Type A and increase rate <Missing Modifier> of respiration and vasoconstrictive response. A's were found to have higher serum cholesterol levels. These and some other results suggest increased sympathetic arousal in Type A males.

Holmes (1968) reported more frequent use of denial and projection by type A's in response to stress. Other researchers also reported cognitive avoidance in Type A's under conditions of ego threat (Carver et al., 1977; Weidner & Matthews, 1978). In a teacher-learner analogue, Type A college students who were motivated to seek approval were less certain as to whether a verbal message actually conveyed approval (Brunson, 1982). In a memory task involving a five-letter stimulus, A and B subjects were tested on both recognition and degree of confidence in their judgments of category membership. In the absence of explicit instructions concerning either frequency or centrality of stimulus elements, A's tended to focus attention on frequently occurring stimulus attributes, tended to form categories with relatively restricted definitions, and reported a higher degree of confidence in category membership judgments (Humphries, Carver, & Neuman, 1983.)

This collection of results raises questions concerning both design and theory for future research. How do we operationalize the relevant cognitive attributes, such as attention and denial? How do we relate these constructs to the "hurry sickness" and "fundamental insecurity" noted in young cardiac patients?

A possible conceptualization. The Personality Assessment System (PAS) is a theory of normal personality functioning premised on the assumption that an individual's genetic heritage determines certain innate strengths and weaknesses which interact with demands from the environment to produce long-term changes in preferential behavior. Gittinger's work (Winne & Gittinger, 1973) suggests three broad dimensions of cognitive functioning within the individual personality, a perceptual or input dimension (I-E), an organizational or infor-

mation dimension (R-F), and behavioral output dimension. Saunders and Gittinger (1968) suggested that while these dimensions could be measured by the Wechsler Adult Intelligence Scale (WAIS), there were some mismatches in the scales as they existed and that there were possibilities of other measurable dimensions. Saunders has proposed a fourth dimension, task or goal orientation (T-G), which attempts to measure a person's tolerance for and capacity for coping with stress.

Preliminary work on the Fourth Dimension has been promising as a means for characterizing an individual's tolerance for stress and preferred stress level. Measurement of this dimension involves a variation of the Stroop Color Word Task to measure the primitive level, Digit Symbol from the WAIS to measure the basic level, and a time estimation task for a surface level measure. The Stroop task, called Color Naming (CN) in the PAS, is stressful in a fundamental cognitive sense. Conflict is generated between the two cerebral hemispheres (probably more complex than this); the verbal production of color name, a left hemisphere function, for a common channel of expression. Performance on CN requires a subject to internalize, habituate, and integrate information, thus resistance to interference stress is a measure of the individual's ultimate capacity for learning and adaption (Saunders, 1980).

Preliminary evidence suggests that his CN scores are achieved by individuals who tolerate stress well, may even be facilitated by stress, and who appear confident, even overconfident in their skills and abilities. In contrast, low CN scores dislike stress, may attempt to avoid potentially stressful situations, and tend to exhibit a generalized lack of confidence. Extremely low scores may indicate a tendency to avoid new experiences altogether (Heyman, 1980).

Problem-solving style, particularly effort fullness, is measured by Digit Symbol (DS) from the standard WAIS. Effort fullness is closely related to preferred stress level and represents the extent to which the subject, under stress, will compensate by moving faster or committing more available energy (Saunders, 1980). High scores describe individuals who work well under stress, but extremely high scores suggest ineffective over activity. A tendency to collapse under stress is indicated by low score (Heyman, 1980).

The surface level Fourth Dimension measure, Time Estimation (TE), closely resembles the laboratory procedure already described in this review. As in the Type A studies, PAS researchers are interested in an individual's tolerance with the normal pace of activities, essentially patience or the lack of patience. In addition, TE performance may be influenced by overall activity level or the need for action; productivity versus Impulsivity may constitute yet another behavioral dimension reflected in TE scores (Heyman, 1980).

The Fourth Dimension subtests differ from the subtests within the conventional WAIS in that there is less reason to believe that performance varies with general intellectual functioning, called Normal Level (NL) in PAS terminology. Raw scores can be converted to weighted standard scores (WTS) (Saunders, 1982) and high or low direction can be determined for interpretation by using their deviation from a WTS of 12 (Heyman, 1980). In the PAS framework, the pattern characterized by low CN, high DS, and low TE is called the "contender" or "stress energized" type.

"Stress energized" describes an "ambitious, compulsive, aggressive and potentially depressive" individual, one who is vulnerable to the immobilizing effects of stress, but determined and conditioned to compensate for his/her deficiencies by achieving more in less time. This individual is a chronic over attempter, disappointed with him or herself, and frustrated with others to the extent that irritable and aggressive behavior may interfere with interpersonal functioning (Heyman, 1980).

Descriptions of the "stress energized" type are remarkably congruent with Freidman and Rosenman's original clinical descriptions of Type A "hurry sickness" and "fundamental insecurity".

Research Hypothesis

This study addressed the notion that the "contender" or "stress-energized" personality style, as reflected in the characteristics PAS Fourth Dimension pattern, is descriptive of Type A behavior. It was predicted that higher scores on the JAS would be associated with the low CN, high DS, low TE pattern. It was also predicted that Type A individuals would show greater degree of compensation on the PAS Fourth Dimension, due to attempts to overcome self-perceived deficiencies by increased effort and speed, as evidenced by increasingly marked differences between CN and DS scores associated with increasingly higher JAS scores.

Much research on the CPBP has used male subjects. The current study attempted to replicate earlier findings for time estimation using female subjects.

Previous laboratory investigations of time estimation in Type A behavior have utilized discrete intervals. In the PAS, the TE score is derived from the cumulative total of elapsed time estimated on seven trials presented sequentially as intervals of 20, 5, 10, 30, 10, 5 and 20 seconds (TE 1 to TE 7 respectively). Total time scores are continuously distributed (Saunders, 1982).

Method

Subjects

Female volunteers were drawn from the pool of General Psychology students at the University of Missouri-Columbia. Research subjects receive course incentives for their participation. Subjects were naive to the nature of the experiment, but were given an explanation after all procedures had been completed.

Measures The JAS was scored using the simple unit procedure. The Fourth Dimension subtests of the PAS were administered individually in the order DS, CN, TE. DS also functions as a replacement for the set inducing produced by the full Stroop procedure. Time estimation tasks requiring the estimation of 60 and 90 second intervals with and without interference were also administered individually. Interference was operationalized as reading aloud from a technical article.

Procedure

Upon arrival, subjects signed the required release form, removed their watches, and completed the JAS questionnaire. The experimenter scored the JAS after the other procedures were completed and was blind to the subjects' JAS score during testing. Since Glass and others have suggested that manifestation of Type A behavior might be dependent upon the presence of ego threat,

the WAIS manual was prominently displayed.

Following the JAS, the PAS subtests were administered. Then the time estimation tasks were administered in the order 60 seconds without interference, 90 seconds without interference, 60 with interference, and 90 seconds with interference. All time estimations were indicated by having the subject stop a stopwatch when she believed the interval had passed.

Research Design and Statistical Analysis The first research problem concerned the relationships among three continuous independent variables, DS, TE and CN, and one independent variable, JAS score. The initial hypothesis tested was that CN, DS, and TE would be associated with variance in JAS scores. The second hypothesis tested was that higher JAS scores would be associated with differences between CN and DS (CN - DS). This computed variable is more like the PAS notion of compensation. These hypotheses were tested by multiple regression.

The second research problem concerned the nature of time urgency and tested the hypothesis that faster estimates of the passage of either 60 or 90 second intervals under both interference and noninterference conditions would be associated with higher JAS scores. Raw time estimates for each of the four independent variables were divided by quartile. A 4 x 4 factorial design was used.

Results

Descriptive Statistics

Table 1 shows a summary of means, standard deviations, minimum and maximum values for all variables, and age of subjects at time of testing. DS scores were subtracted from CN scores resulting in the new variable labeled CompB.

First Hypothesis - PAS Variables

Regression. Of the three independent variables in the first multiple regression, only TE was related to JAS score: F, (1, 70) = 7.28, p.01.

A separate regression analysis was used to investigate the relation between the independent variables (CN - DS) and TE. (CN - DS) was not significantly related to JAS, but the interaction of (CN - DS) and TE was significantly related to JAS: F (1,70) = 6.41, $p < .02$. This seems to indicate that the general pattern of low CN, high DS, and low TE is associated with higher JAS scores.**Correlation.** Pearson correlations are given in Table 2 for TE, CN, DS, (CN - DS) and JAS.

Second Hypothesis - Experimental Time Estimation

Quartiles. Raw time estimates for each of the four independent variables were divided by quartile and assigned values 1 through 4, representing low, medium low, medium high, and high levels respectively. These levels are shown in Table 3.

Analysis of Variance. A 4 x 4 ANOVA was computed to examine the relationships among the dependent variable JAS and the four independent variables, 60" w/o, 90" w/o, 60" w/I, and 90" w/I. The following 2-way interactions were included in the analysis: 60" w/o by 90" w/o, representing the without interference condition; 60" w/I by 90" w/I, representing the with interference condition; 60" w/o by 60" w/I, repre-

Table 1. Descriptive Statistics for All Variables and Age

	Descriptive Statistic				
Variable	Mean	Standard Deviation	Minimum	Maximum	Range
Age at testing	20.63	3.09	17.00	33.58	16.58
JAS	8.92	3.46	2.00	16.00	14.00
DSY	13.41	1.79	8.00	18.00	10.00
CN	11.18	1.78	7.00	15.00	8.00
TE	9.59	2.63	4.00	17.00	13.00
CompB	- 2.22	2.16	- 8.00	7.00	15.00
60″ w/o	49.36	17.68	7.00	80.00	73.00
90″ w/o	75.17	29.71	10.00	178.00	168.00
60″ w/i	57.32	22.03	9.00	119.00	110.00
90″ w/i	87.48	28.28	14.20	183.00	168.00

Note. DS, CN, and TE are given as standard scores.

Table 2. Intercorrelations of PAS 4th Dimension Variables

	Variables				
Variables	JAS	CompB	CN	TE	DSY
JAS	1.00	.06	.06	-.30	-.14
CompB		1.00	.60	-.18	-.60
CN			1.00	-.02	.27
TE				1.00	.20
DSY					1.00

Table 3. Quartile Levels for Experimental Time Estimation Variables

	Quartile Rank			
Variable	Low	Medium Low	Medium High	High
60″ w/o	7.8 - 36.9	37.0 - 50.6	51.0 - 59.0	60.0 - 80.0
90″ w/o	10.0 - 58.0	58.0 - 69.2	71.0 - 96.7	99.0 - 178.0
60″ w/i	9.9 - 39.4	40.0 - 56.2	56.9 - 69.0	71.0 - 119.0
90″ w/i	14.2 - 67.0	69.4 - 89.0	90.0 - 101.0	104.0 - 183.0

Table 4. Intercorrelations of All Time Estimation Variables

	Variable				
Variable	60″ w/o	90″ w/o	60″ w/i	90″ w/i	TE
60″ w/o	1.00	.86	.62	.62	.81
90″ w/o		1.00	.66	.60	.76
60″ w/i			1.00	.71	.54
90″ w/i				1.00	.48
TE					1.00

Table 5. Intercorrelations for All Intervals in the PAS Time Estimation Procedure

	Interval						
Variable	TE 1	TE 2	TE 3	TE 4	TE 5	TE 6	TE 7
TE 1	1.00	.61	.73	.68	.61	.49	.64
TE 2		1.00	.70	.67	.57	.40	.55
TE 3			1.00	.77	.73	.46	.77
TE 4				1.00	.66	.40	.84
TE 5					1.00	.68	.83
TE 6						1.00	.57
TE 7							1.00

senting the 60 second interval condition; and, 90" w/o by 90" w/I, representing the 90 second interval condition. None of the independent variables nor two way interactions were significantly related to JAS score, but the 90" w/o by 90" w/I interaction approached significance; F (1,70) = 2.18, p. 07.

Because the addition of several intervals in the PAS data was related to JAS, the four experimental time intervals were added by interval and by interference conditions to produce four new variables. A second ANOVA was performed on these additive combinations. Only the 90 second additive condition (90" w/o plus 90" w/I) was significant; F (1, 70) = 2.58, p.05.

Single interval time estimation does not appear to be a very reliable procedure. The PAS TE does seem to benefit from adding several different interval estimates. Intercorrelations of the experimental time estimates and TE are given in Table 4. The Intercorrelations of the different intervals of TE are given in Table 5.

Discussion

Scores for JAS, TE, DS, and CN are continuously and fairly normally distributed within the sample, and mean scores are in the expected range, but the results suggest that Type A women and/or "stress energized" types may be slightly over represented in the sample. The mean age may be higher than that for samples in previous studies and, since Type A characteristics are assumed to be more apparent in older, career oriented women, age may account for a slight shift in JAS, TE, and DS scores in the Type A or "stress energized" direction. Many of the women tested were in Summer School and this may have introduced selection factors, such as ambition or concern with academic performance into the study. With these exceptions, the sample seems representative of college women.

The findings of this study support the conclusion that Type A behavior as measured by Form T of the JAS resembles the response style characteristic of the "contender" or "stress energized" PAS type (Heyman, 1986). Taking the Fourth Dimension subtests independently, only TE is related to JAS score. This finding is consistent with previous research and supports impatience as a prominent factor in the expression of Type A behavior in women as well as men.

Consistent with the PAS notion of compensation, higher JAS scores are related to (CN - DS) x TE, with a negative sign, suggesting that a pattern of low CN, high DS, and low TE may be the most common pattern of Type A's. Since CN is not, by itself, related to JAS score, it may be that Freidman and Rosenman are right in their notion that the important thing is not a fundamental ability to tolerate interference stress, but the interpretation of the individual that they have a deficiency that needs to be overcome.The PAS conceptualization of the "contender" as insecure, compulsive, chronically frustrated, and driven to attempt more in less time sounds much like the descriptions of Type A people. The PAS Fourth Dimension provides a workable conceptualization of the Type A coronary prone behavior pattern. These findings are also consistent with the PAS model of personality development as compensation from innate tendencies toward long term environmental press.

This study found no differences between Type A and Type B women on standard

time estimation tasks. As indicated by the correlational analysis, reliability for short interval time estimation is less than optimal. Scores were summed in an attempt to reduce the impact of chance variations, but A/B differences were apparent only on the sum of the longer intervals. The presence or absence of interference did not affect results. Across previous studies, A/B differences are more often reported for intervals of longer duration.

The findings of the present study are consistent with some previous studies. The failure to replicate other studies using comparable methods, and the overall inconsistency of time estimation in Type A studies may be attributable to poor reliability of time estimates for discrete intervals.

The results of the present study overall do lend support to the conclusion that Type A's tend to be more impatient than Type B's when impatience is operationalized as production of short intervals of elapsed time. The result of the PAS time estimation procedure clearly supports this conclusion. The findings of the present study also suggest that the PAS method of summing scores over repeated administrations to derive a total score may be a more reliable means of operationalizing time urgency.

The production method of time estimation employed in both the previous Type A studies and the PAS procedure uses a physical standard, such as seconds or minutes, which reflects cognitive representation of an external referent (Eisler, 1976). These methods may be distinguished from purely sensory standards of time perception as measured by ratio setting, psychophysical scaling procedures. Though little is known about theorigins of Type A behavior, it is assumed to be acquired as a result of environmental contingencies which makes the physical standard seem appropriate.

The use of repeated measures, with intervals of either the same or of varying durations, however, adds a new element to the time estimation procedure. Some of the typical problems encountered with repeated measures may not apply to time estimation. Fatigue should not be a factor as the procedure is neither lengthy nor strenuous. Practice should not affect time estimates if care is taken that subjects do not receive feedback. However, Saunders (1985) has cautioned researchers about a possible orientation effect on the first interval of the PAS procedure. Time estimates might also be susceptible to systematic changes due to anxiety, or nonspecific emotional/ physiological arousal. This could be an important factor in Type A research if, as previous research has suggested, Type A's tend to become more aroused than do Type B's during forced inactivity. Other unhypothesized cognitive factors may come into play as well. In addition to providing a more reliable score, summing across several intervals may be used to illuminate differences in cognitive "set." Congruent with the "narrowed focus of attention" hypothesis, these differences might become apparent only across repeated administrations.

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