



Duration estimates and behavioral measures as a function of sex and personality
by Donald James Warner

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in
Psychology
Montana State University
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Abstract:

A behavior pattern called Type A is related to coronary heart disease and early death due to cardiovascular illness. Type A behavior is characterized by physiological indicators of long-term stress, extreme time consciousness, and a tendency to overwork. This study investigates the possibility that Type A behavior may be due in part, to a relative inability of Type A individuals to determine the passage of time through the information gained only from somatic cues. Through the use of the Bortner scale, a total of 112 students were determined to be either Type A or B personality, and then using the production method, were assessed on their ability to produce a specific duration in an environment of reduced stimulation. Two possible behavioral indicators of Type A personality were also obtained. The degree to which an individual's arrival time deviated from his or her scheduled appointment time was determined, as was whether or not the individual wore a watch. As compared to Type B individuals, Type A individuals showed less accuracy and more variability in estimating duration. Females arrived earlier than males at their scheduled appointments, and wore watches less often. Implications and potential applications of these findings are discussed.

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A thesis submitted in partial fulfillment
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of a thesis submitted by

Donald James Warner

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VITA

Donald James Warner, son of Robert Sr. and Kathryn Warner, was born September 29, 1950, in West Allis, Wisconsin. He graduated from Boys' Technical High School in Milwaukee, Wisconsin in June, 1968. After serving in the United States Air Force as a Medical Service Specialist, he attended the University of Wisconsin-Milwaukee. He graduated from the Psychology Department in May, 1978 with a Bachelor of Arts degree. Mr. Warner entered the Graduate school of Montana State University in September 1979.

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ABSTRACT

A behavior pattern called Type A is related to coronary heart disease and early death due to cardiovascular illness. Type A behavior is characterized by physiological indicators of long-term stress, extreme time consciousness, and a tendency to overwork. This study investigates the possibility that Type A behavior may be due in part, to a relative inability of Type A individuals to determine the passage of time through the information gained only from somatic cues. Through the use of the Bortner scale, a total of 112 students were determined to be either Type A or B personality, and then using the production method, were assessed on their ability to produce a specific duration in an environment of reduced stimulation. Two possible behavioral indicators of Type A personality were also obtained. The degree to which an individual's arrival time deviated from his or her scheduled appointment time was determined, as was whether or not the individual wore a watch. As compared to Type B individuals, Type A individuals showed less accuracy and more variability in estimating duration. Females arrived earlier than males at their scheduled appointments, and wore watches less often. Implications and potential applications of these findings are discussed.

INTRODUCTION

One of the leading causes of death in the United States is coronary heart disease (CHD). CHD is generally considered to be a pre-morbid condition characterized by a thickening of the arterial walls due to a build up of fatty deposits (lipids) on the interior surface. CHD is a prime factor in the etiology of conditions such as myocardial infarctions (heart attacks), cardiac arrhythmias, congestive heart failure, brain infarctions (strokes), and essential hypertension (high blood pressure).

A neuropsychological component to CHD has been suspected since early in the twentieth century. Sir William Osler (1910) was the first person to describe the behavior pattern characteristic of people who develop angina pectoris (a syndrome found in advanced cases of CHD that is characterized by a sensation of constricting thoracic pain accompanied by a feeling of suffocation and impending death). This is most often due to myocardium anoxia and is frequently precipitated by effort or excitement. Osler cited worry and tension in combination with a heavy work load as a primary cause of angina.

The basic nexus of behaviors first described by Osler has been further delineated by researchers in both laboratory and clinical settings, and was called the Type A behavior pattern by Rosenman and Friedman (1961). Type

A behavior, or the coronary-prone behavior pattern, is characterized by excessive drive, aggressiveness, ambition, involvement in competitive activities, frequent vocational deadlines, pressure for vocational productivity, an enhanced sense of time urgency, an increase in the amplitude and frequency of motoric mannerisms, a staccato style of speech, and a chronic propensity toward the struggle to achieve a great many goals in a relatively short period of time (Burnam, Pennebaker, & Glass, 1975; Jenkins, Roseman, & Friedman, 1967).

At the more extreme levels of this behavior pattern, where markedly early mortality becomes a factor, Type A individuals generally display an array of the physiological congeners of CHD. These congeners are the precursors of an ischemic process that is engendered by arterial wall thickening, and appears to have an origin in the interplay of endogenous (genotypic) and environmental factors. Elevated serum lipids, accelerated blood coagulability, increased excretion of catecholamines and impaired triglycerid tolerance have all been associated with the pathognomic indicators of Type A behavior and the development of CHD (Friedman, Byers, & Rosenman, 1964; Friedman & Rosenman, 1959; Friedman, Rosenman, & Byers, 1964; Friedman, Rosenman, & Carroll, 1958; Rosenman & Friedman, 1961, 1963; Rosenman, Friedman, Straus, Wurm,

Jenkins, & Messinger, 1966; Rosenman, Friedman, Straus, Wurm, Kositchok, Haan, & Werthessen, 1964). If an individual displays a general absence of the behaviors and physical findings associated with the Type A pattern, he or she is usually considered to fit the Type B behavior pattern and are at a much lower level of risk in regard to the development of CHD (Bortner, 1969; Bortner & Rosenman, 1967; Jenkins, Zyzanski, & Rosenman, 1971).

Although the overt behavioral manifestations and some of the physiological correlates of Type A behavior are well known and agreed upon by researchers in the field, there is currently no clear-cut theory that accounts for all of the ways Type A behavior is manifested. Some researchers (Bortner & Rosenman, 1967; Friedman & Rosenman, 1959) have advocated a diathesis-stress model of pattern development, but it has received only equivocal research support to date. Rahe, Hervig, and Rosenman (1978) have found the heritability of Type A behavior to be questionable. Evidence of Type A behavior has been found in children as young as those of kindergarten age (Mathews & Angulo, 1980). Other researchers (Burnam et al., 1975) claim that Type A behavior is a strategy for maintaining environmental control. This is supposedly accomplished through the acceleration of the pace at which the individuals live, in order to achieve a sense of mastery over their environment. Irrespective of theory, one of the more

common ideas in the literature is concerned with an apparent distortion of time sense that is found in Type A individuals (Bortner & Rosenman, 1967; Burnam et al., 1975; Price & Clarke, 1978). Many studies (Bortner & Rosenman, 1967; Burnam et al., 1975; Price & Clarke, 1978) have found that individuals who exhibit Type A behavior do tend to perceive time as passing faster than it actually is. However, this finding can be viewed as possibly in question depending how the duration estimate was assessed.

The majority of studies (Glass, Snyder, & Hollis, 1974, being the major exception) have utilized either a production or a verbal estimation strategy to assess the estimates of duration. Comparing results obtained from the use of these two methods, however, may produce inappropriate interpretations in terms of any theoretical framework. In the verbal estimation method, an individual is presented with a duration that is operatively defined, and after experiencing it is asked to verbally estimate its length. In the production method, an individual is asked to operatively define (usually through the use of some form of manipulandum and concurrent light or tone or both) her or his judgement of a verbally defined duration. If the duration judgement is shorter than the objective

standard, differing attributions as to the experience of duration can be made. With the verbal estimation method, the interpretation is made that the individual's subjective temporal units are larger than objective temporal units, or that the individual's "internal clock" runs slower than an objective external clock. With the production method, the individual's subjective temporal experience seems to be bound in units that appear to be smaller than objective temporal units, or the individual's "internal clock" runs at a faster pace than an objective external clock (Bindra & Waksberg, 1956). This seeming contradiction presents some difficulty in terms of the conceptualization of the processes needed to arrive at the development of the Type A personality pattern. The questions raised by this issue seem to be that perhaps Type A and B individuals experience duration differently, or perhaps the problem may be that they label (in minutes and seconds) a given duration in a consistently differing fashion.

There is however, a more parsimonious explanation for the discrepant time estimation abilities displayed by the people that exhibit Type A behavior. It may be that Type A behavior is partly the result of some essential relative inability to discriminate the passage of time.

This would tend to introject an element of randomness in their estimates of duration that would potentially increase the amount of variability found both between subjects on a single measure, and within subjects on repeated measures. With this theory, no attributions are made regarding the length of hypothesized subjective temporal units or the relative speed of the individual's "internal clock." Instead, the discrepant findings in the literature are able to be attributed to an artifact of the method used to estimate durations.

In this study, it is proposed that the lack of a person's ability to discriminate the passing of time is seen as a prime factor in the ontogeny of Type A behavior. Our society and culture both select for and reinforce with success the ability to perform under temporal constraints. This situation provides the environmental context under which the Type A pattern develops. In order for the individuals who have the misfortune of not being able to estimate time passage accurately to achieve a consistent level of success in their lives, it becomes almost necessary for them to develop an extreme time consciousness and preoccupation with over work. This is accomplished in order for the afflicted individuals to be sure that

they are able to complete the tasks that they have taken on in the amount of time that is allotted to them. This behavior is then reinforced by the positive consequences that are associated with the achievement of set goals within given time constraints. This situation then leads to the development of a chronic cardiovascular arousal pattern. Therefore, on the surface it would appear that Type A individuals do live at the accelerated pace that was proposed by Burnam et al. (1967).

A major unresolved issue is the question of whether or not there are sex differences both in the estimation of the passing of time and in Type A behavior. Most research on the factors that are involved in the Type A pattern has concentrated on males. This is most likely due to the prevalence of males in the majority of the populations that have been studied. To date, only a few studies of Type A behavior have been published that include women as participants.

Likewise, the results of research into sex differences in the estimation of duration experience have been equivocal at best. Sex differences, when found, have either been of small magnitude (Geer, Platt, & Singer, 1964) or were of ambiguous interpretation (Roecklein, 1972).

This study was conducted in an attempt to resolve some of the problems with the uncertain findings that have resulted from research in the past. When the literature is reviewed with an emphasis on potential sources of conflict between studies, it becomes apparent that methodology rather than possible problems with the basic construct are likely in both equivocal results and the failure to replicate the significant findings that have been obtained (Jenkins et al., 1971). Many of the studies that have been conducted in the area have used inadequate numbers of participants (Bortner et al., 1967; Burnam et al., 1975; Friedman et al., 1958; Friedman et al., 1960; Glass et al., 1974), or they have used inadequate control groups or methodology that did not address the appropriate questions (Glass et al., 1974; Motiff & Palladino, 1980).

The experimental question that was assessed in this study was: Is there a difference between Type A and Type B individuals in their ability to estimate a given passage of time (duration)? Further, to what extent is this ability modified by the individual's gender and the length of the duration he or she is attempting to estimate?

The theoretical basis for these questions is that it is possible that a difference exists in the ability to estimate durations between certain groups of individuals. In this study it is hypothesized that Type A individuals are less able to estimate a given duration than are Type B individuals, and therefore tend to develop compensatory strategies that allow them to be able to function in a "real time" framework. These compensatory efforts, if utilized for a sufficient length of time, eventually form the nexus of characteristics of the Type A personality pattern and are subsequently reinforced through social mediation processes.

To differentiate the population sampled in this study, I decided to use the short form of Bortner's (1969) rating scale for Type A behavior to classify participants into Type A and B categories. This scale was chosen for its short length (seven items), its relative ease of administration (paper and pencil, taking at most five minutes for both instruction and completion), and its high degree of predictive validity. The Bortner scale is able to predict Type A behavior with a level of accuracy that compares favorably with many of the other objective

measures (Jenkins et al., 1971; Motiff & Palladino, 1980; Robinson & Heller, 1980). The objective measures have a somewhat lower level of predictive ability compared to the original predictive criterion measure, the Standard Interview (developed by the Western Collaborative Group Study, Rosenman et al., 1964). But this is mainly attributable to the influence of the undeveloped Type A's and the Type B's who exhibit some Type A characteristics that seem to occupy the mid-percentiles of the Type A/B continuum. To obtain a sample more heavily biased in the direction of those who exhibit stronger Type A or B characteristics, and hopefully reduce the size of the error term in the analyses, I decided not to study those individuals whose scores on the Bortner's Scale fell within the middle one-third of the distribution. This was the procedure used by Glass et al. (1974), and it appears to produce a strong split between the A and B groups.

In addition to the participant's sex and personality type, the present study examines effects of the length of the time period on the participant's estimates of duration. Previous findings (Glass et al., 1974) reveal that the amount of error present in duration estimates increases in

proportion to the length of time being estimated. It is possible that there is an interaction between the length of time being estimated and the personality type of the participant, with Type A individuals increasing their amount of error at a greater rate than Type B individuals as the length of the time period increases.

The production method was used to determine the participant's duration estimates for two basic reasons. The first is that, when examined across subjects, the production method tends to produce estimates with a finer overall level of gradation in comparison to the verbal estimation method. With verbal estimates, people tend to give rough estimates of the amount of time that has passed, with resultant potential for negative effects on the analysis of the data. The second reason is linked to the first. When the participants give their rough estimates, it takes time and effort from the experimenters to elicit a more refined response, and within the context of gathering data, there is usually little time to spare.

Two possible behavioral indicators of differentiation between Type A and B personalities were included in the

study. The degree to which a person's arrival time at their experimental session deviated from their scheduled appointment time was assessed in the belief that there might be a difference in how individuals of either Type A or B personality respond when confronted by the implicit demands of a set appointment time.

It was hypothesized that if Type A individuals do indeed have a decreased ability to estimate the passage of time from somatic cues, they might differ in some consistent fashion from Type B individuals in the degree to which they vary from their scheduled appointment time. Also examined was whether or not an individual wears or carries a watch. This variable was included on the hypothesis that if Type A individuals have a decreased ability to estimate time passage, they might tend to wear watches more often than do Type B individuals. Both of these behavioral measures were also analysed in terms of the participant's sex. Our society differentiates greatly between males and females on many aspects of behavior, and it was hypothesized that the participant's sex might be an important factor in whether or not the Type A personality factor becomes manifested behaviorally.

METHOD

Subjects

An initial sample of potential participants was solicited from the population of students attending three introductory psychology courses at Montana State University. The participants were volunteers whose cooperation was obtained through the promise of experimental credit that was to be added to their final grades in the psychology course that they were attending.

A total of 584 individuals completed the Bortner scale, and after the scales were scored, were included in the formation of a Type A/B continuum. Following the procedures first used by Glass et al. (1974), the individuals in the middle one-third of the distribution were not studied further in order to achieve a strong Type A/B differentiation. After the exclusion of the middle one-third of the distribution, the Type A personality was operationally defined as an individual whose score on the Bortner scale was greater than or equal to 6.5. Similarly, a Type B personality was operationally defined as an individual whose score on the Bortner scale was less than or equal to 5.5. This procedure resulted in an initial subject pool

of 386, with 190 Type A personality individuals (74 males and 116 females), and 196 Type B personality individuals (98 males and 98 females).

A 2 (Type A or B) X 2 (male or female) X 2 (one- or five-minute duration) factorial design was used, with participants randomly assigned to duration length. The individuals were contacted by phone and requested to volunteer to take part in a psychology experiment for credit. Upon their assent, the individual participants were scheduled in groups of two to a particular time slot. Assignment was based on the criteria of which duration was to be estimated, with both participants scheduled for the same time slot, estimating the same duration. This was accomplished for both the convenience of the experimenters, and to reduce possible sources of error inherent with the performance of two or more sets of differing simultaneous operations by the experimenters. When all of the eight possible cells were filled, a total of 112 participants were included in the study. There were 56 females and 56 males, with an equal representation of Type A's and B's of each sex. The mean Bortner score for male Type A participants was 7.10, SD= 7.129. The mean score for female type A part-

icipants was 7.154, $SD = 7.175$. A t test performed on the mean Bortner scores for the female and male Type A's indicated that there was no significant difference [$t(56) = .029$, $P < .20$] between the two groups. The mean Bortner score for male Type B participants was 4.885, $SD = 4.893$. The mean score for the female Type B's was 4.875, $SD = 4.914$. A t test performed on the mean Bortner scores for the female and male Type B's revealed that there was no significant difference [$t(56) = .008$, $P > .20$] between the two groups. The age range of the participants was 18 to 36 years.

Apparatus

The experiment was conducted in two small experimental rooms (approximately 3.2 m long X 1.8 m wide X 2.9 m high), each containing a standard wooden student's desk with a small (10 cm X 15 cm X 7 cm) lucite box mounted on the work surface. On each of these lucite boxes there was a pilot light and an on/off switch to operate it.

Also included in the physical setting was a common room (approximately 6.4 m long X 3.2 m wide X 2.9 m high) that contained two wooden desks for the use of the participants while they were filling out forms, and two wooden chairs for use by the experimenters. The electronic timing

apparatus and printed materials were on a table located in the front of the room.

The duration measurement apparatus was composed of two Hunter model 120 Klockounters, the on/off switches, and pilot lights used by the participants, and the wiring used to connect all of the electrical apparatus. The timers were wired so that the starting and stopping of the units was controlled by the participants when they were seated in the data collection rooms (see Appendix A for the wiring schematic).

The printed materials consisted of the Bortner rating scale and the instructions for its completion (see Appendix B).

Procedure

Participants were seated in a common waiting room upon their arrival. While there, they were requested to fill out and sign a voluntary subject participation statement, and to remove any watches they might have and put them in their pocket, purse or backpack. The data for the behavioral measures of arrival time and watch wearing behavior were ascertained and recorded while the participants were complying with the requests. After the voluntary partici-

pation forms were collected, the participants were led to the small experimental rooms where they were seated, one in each room. These directions were then read to them:

"In this portion of the experiment, your task is to throw the switch and turn on the light for a period of time that you estimate to be one [five] minute[s]. Please do not count to yourself, count your heartbeats, or use any other similar method to estimate how long to leave the light on. All we want is an estimate of your feeling of when one [five] minute[s] has elapsed. When you feel that one [five] minute[s] is over, turn off the light and the experimenter will come back into the room."

Any questions were answered, the experimenters left the rooms, and the duration estimation portion of the study began.

Participants were required to produce their estimate of either a 60- or a 300-sec. time period using the production method. The estimate was operatively defined through the turning on and the turning off the pilot light with the on/off switch. The manipulation of the switch concurrently started and stopped an electronic timer located in the

common room. In addition to the specific instructions given to the participants regarding estimation methods, they were forced to rely on somatic cues to estimate the passage of time by performing their estimates while in an environment of reduced external stimulation. There were no objects present other than the chair in which they sat, and the control apparatus for the timers. There was little or no ambient noise, and no source of information by which to judge the passage of time. Upon the completion of the estimates, the participants were returned to the common room, where they were debriefed.

RESULTS

Duration Estimates

Each participant's duration estimate was initially used in a 2 x 2 X 2 (Sex X Personality Type X Duration) analysis of variance. Not surprisingly, the main effect of duration was significant [$F(1, 111) = 262.1, p < .001$]. The mean production of the 60 sec time period was shorter than the mean production of the 300 sec period. There was also less between-subjects variability in the 60 sec duration condition than there was in the 300 sec condition as is revealed by a Levene's (1960) test of the heterogeneity of variance [$F(1, 111) = 65.82, p < .001$], (Kepple, 1973). The main effect of personality type was only marginally significant [$F(1, 111) = 3.20, p < .10$], with Type A participants producing slightly longer estimates than did Type B participants in both the 60 sec and 300 sec conditions. However, a Levene's analysis revealed that Type A individuals were significantly more variable [$F(1, 111) = 5.60, p < .05$] in their estimates than were Type B individuals. Irrespective of the lack of significant findings for the main effect of sex [$F(1, 111) = 1.13, p < .30$], or for any of the interactions [all $F(1, 111) < 1.88$], these findings, as a whole, tend to support the

original hypotheses that Type A individuals would produce estimates of duration that were both longer (although only marginally) and more variable than Type B individuals (see Table 1).

Next, each participant's duration estimate was assessed as a function of its absolute error, or deviation, from the objective standards of 60 and 300 seconds that were utilized. Again, there was a significant main effect of duration [$F(1, 111) = 52.37, P < .001$], indicating a greater absolute level of accuracy at the 60 sec than at the 300 sec duration. More importantly, in comparison to the Type B participants, those with the Type A personality were significantly less accurate with their estimates [$F(1, 111) = 4.27, P < .05$]. There was no main effect for sex [$F(1, 111) = 0.00$], nor were any interactions significant [all $F(1, 111) < 1.63$]. However, in combination with the results from the analysis performed on the actual duration estimates, these findings lend confirmatory evidence that Type A individuals are indeed less accurate and more variable when estimating the passage of time than are Type B individuals.

Table 1

M and SD (in parentheses) of Each Duration Estimate Measure
(in seconds) for Each Combination of Duration and
Personality Type

Personality Type	Duration		
	1 Minute	5 Minutes	Combined
	Production		
A	63.3 (32.5)	339.8 (133.3)	201.6 (168.9)
B	56.7 (15.4)	290.1 (83.8)	173.4 (131.3)
<u>M</u>	60.0 (25.6)	314.9 (114.1)	187.5 (150.1)
	Absolute Deviation from Standard		
A	20.6 (25.3)	106.3 (89.7)	63.4 (78.6)
B	12.6 (9.3)	72.7 (42.9)	42.6 (43.2)
<u>M</u>	16.6 (19.5)	89.5 (72.3)	53.0 (60.9)
	Absolute Deviation from Mean (Levene's Test for Heterogeneity of Variance)		
A	19.8 (23.8)	106.2 (80.1)	63.0 (73.2)
B	10.6 (7.8)	72.2 (41.9)	41.4 (43.1)
<u>M</u>	15.2 (18.3)	89.2 (66.1)	52.2 (58.2)

Arrival Time

Arrival time data were calculated in terms of the number of seconds that a participant arrived early (a positive error, or discrepancy), or late (a negative error, or discrepancy), and were subjected to a 2 X 2 (Sex X Personality Type) analysis of variance. Overall, participants tended to arrive early for the experiment, with a mean discrepancy of 147 sec. (SD = 378.52 sec). The only significant effect found in this analysis was a main effect of sex [F(1, 111) = 5.00, P < .05]: Females arrived significantly more early (M = 228.1 sec, SD = 360.64 sec) than did males (M = 65.9 sec, SD = 396.39 sec).

A Levene's test of the heterogeneity of the variance indicated that neither males or females, nor Type A or Type B participants were more variable by themselves. However, a significant Sex X Personality Type interaction was found [F(1, 111) = 7.91, P < .01]. Male Type B participants were the least variable (M = 168.42 sec, SD = 196.25 sec). This difference in variability was found to be significant [t(112) = 4.78, P < .001]. Differences in variability were also found between male Type B and Female Type B participants (M = 368.96 sec, SD = 307.05 sec), [t(112) = 2.86,

$P < .01$], and female Type A participants ($M = 275.04$ sec, $SD = 241.18$ sec) and male Type B participants [$t(112) = 1.78$, $P < .05$], with both female Type A and B participants being more variable than male Type B.

Watch Wearing

Finally, each participants watch wearing behavior was examined in a 2×2 (Sex \times Personality Type) analysis of variance. There was a significant main effect for sex [$F(1, 111) = 7.50$, $P < .01$], with 57% of the males wearing watches, compared to only 32% of the females. No significant main effect for personality type was found [$F(1, 111) = .61$, $P < .50$], nor was there a significant interaction [$F(1, 111) = 2.45$, $P < .20$].

An examination of the differential frequency of watch wearing between males and females may help to account for, in part, the findings that males tended to arrive at the experiment closer to their scheduled appointment times than did females, yet exhibited more overall variability on the Levene's test for the arrival time data. In the interaction of sex and personality type found on the Levene's analysis, male Type A, and female Type A and B participants were all found to be significantly more variable on their

arrival times than male Type B participants. A similar pattern of results was found to exist relative to the wearing of watches (see Table 2). Male Type B participants tended to wear watches significantly more often than did female Type A [$t(112) = 2.50, p < .05$], and female Type B [$t(112) = 3.14, p < .01$], and tending toward significance with male Type A participants [$t(112) = 1.63, p < .15$]. It is conceivable that whether or not an individual wears a watch could make a difference in their punctuality at their scheduled appointments.

Table 2

M and SD (in parentheses) of the Levene's Test of the
Arrival Time Data and Watch Wearing Behavior

Cell*	Levene's Test for Arrival Time in Seconds	Watch Wearing Percent
MA	374.32 (340.50)	.46 (.50)
MB	168.43 (196.25)	.68 (.47)
FA	275.04 (241.18)	.36 (.48)
FB	368.96 (307.05)	.29 (.45)

* MA = Male Type A
 MB = Male Type B
 FA = Female Type A
 FB = Female Type B

DISCUSSION

The primary hypothesis that was tested in this study was whether individuals classified as Type A personality differ from Type B individuals in the ability to estimate the passage of time from information gained only from somatic cues.

This hypothesis was tested through the participants estimating durations using the production method in conjunction with specific features of the experimental design. Within this context, it was found that Type A individuals were significantly less accurate in estimating durations than were Type B individuals. On this measure, the hypothesis was further supported by the presence of an increased level of variability found in the responses of the Type A individuals as determined by the Levene's test of the heterogeneity of the variance. This higher level of variability would appear to indicate the presence of an enhanced pattern of randomness in the responding of Type A individuals in comparison to the Type B individuals. This is perhaps indicative of either less reliable perception of the somatosensory processes in Type A individuals, or that the processes themselves are more variable. Regardless, in either case, it appears that Type A individuals have a decreased ability to estimate time passage in comparison to Type B individuals.

An interesting sidelight is the lack of significant sex differences, or interactions of sex and personality on the estimation of time passage. It is the norm in our society that the individuals who develop CHD and who have the Type A personality can be characterized as hard-driving males in positions of authority or similar stress evoking occupations. It may be that the lack of representation of women in this category (those who develop CHD), does not stem from a lack of susceptibility of females to the personality pattern and its pathologic consequences, but rather from a lower level of opportunity of women with the Type A personality to be placed in an appropriate pathogenic environment. A recent study (Davidson, Cooper, & Chamberlain, 1980) focused on Type A behavior, as measured by the Bortner scale, in a group of 148 senior female administrators. It was found that these women compare favorably with males in similar positions, on the pathogenic indicators of Type A behavior. It can possibly be expected that as women come to occupy more high-stress positions, there will be a concomitant increase in their mortality due to the complications of CHD.

This could be properly be assessed through a longitudinal study similar in nature to the Western Collaborative Group Study (Rosenman et al., 1964). It would be instructive to not only monitor the progress of women who are already in positions of high-stress, but also to determine if there is an increase of CHD in susceptible women who in the course of the study, enter into positions of authority and encounter higher levels of stress.

An additional finding of the duration estimate data is that while there is a significant increase in the level of error present as the length of time estimated increases, there is no concomitant sex or personality difference; nor is there any interaction between the duration being estimated and a person's gender or personality type. This might indicate that the lack of sex differences found in the literature on the estimation of time may be due to the fact that there is no real difference in the way that males and females perceive time.

The behavioral measures that were examined in this study produced results that were in many ways counter to the a priori assumptions regarding expected outcomes.

the results that were projected on the differential ability to judge time passage, Type A individuals were expected to be more variable on their arrival times, and to wear watches more often to help counter their poor temporal perception. Except for the case of the Type A male participants, these hypothesized results did not however, occur. It appears that perhaps divergent cultural influences and expectations between females and males may be a greater factor in the behavior of individuals than personality differences are.

In this study, it was found that males tend to wear watches more often than do females. This finding has some interesting implications when combined with patterns that exist in the arrival time data. The sex differences that were found in the analysis of the arrival time discrepancy data may have been the result of the instructions that were given when the participants were contacted by phone and scheduled for their appointments. Due to the problems inherent in gathering data on a large number of subjects, it was necessary to emphasize that the participants should arrive as close to their scheduled appointment times as possible to avoid crowding and delays. As males tend to

wear watches more often than do females, it is possible that the males in this study were able to, in general, arrive at their appointments closer to their scheduled times than were females. It may be that females, due to their relative lower rate of watch wearing, consciously or unconsciously paced their arrival times early enough to assure that they would not be late, and hence produced a mean arrival time that was significantly earlier than the males'.

It might be noted here that apparently the instructions given to the participants when they were contacted by phone were at least to some degree effective. None of the participants failed to keep their appointments. Though it is possible that the promise of extra points for their psychology grades, in combination with the data collection taking place the last week of the academic quarter may also have been a factor.

When arrival time data were examined as a function of its absolute deviation (the Levene's test of the heterogeneity of the variance), an interesting interaction between the sex and personality type of the participant was found. The interaction is somewhat confusing until it is

examined in conjunction with the participants watch wearing behavior. As was mentioned earlier, the same relative pattern of differences found in the interaction was also found with participant's wearing of watches. Male Type B personality individuals were found to wear watches significantly more often than just about everyone else in the study. Therefore it should not be surprising that they were also the least variable on their arrival times. Given possible interdependency of arrival times and watch wearing, it may be that whether or not an individual wears a watch is a predictor of their behavior towards appointment punctuality. This especially true if the individual's sex and personality type are known.

In the future, if additional research confirms the construct of a temporal estimation dysfunction as a prime contributor to the genesis of Type A behavior and subsequent CHD, it might be possible to develop an intervention regimen based on teaching Type A behavior prone individuals to more accurately discriminate the passage of time. This discrimination training would likely be most efficacious if Type A individuals were both identified and training begun at as early an age as possible. This could tend to

promote the reduction of the pathologic psychological and physiological consequences of the Type A behavior pattern to a considerable degree.

In retrospect, several areas of this study could be improved in a replication of the methodology. If sufficient numbers of participants were available, an expansion of the design to include more variables might produce some interesting relationships in the results. An additional level of manipulation in the instructions given to the participants when they are scheduled to their experimental sessions, might produce some differences in their arrival time punctuality. Scheduling one group of participants with instructions to be as prompt as possible, and then scheduling a control group with no instructions regarding punctuality might be an acceptable method. With regard to the estimation of durations, the addition of another group of participants who estimate time passage in the presence of a distraction task might help to discern whether or not individual's estimates are being made on the basis of somatic cues. Also an extension of the durations being estimated to perhaps 10 minutes might pick up differences not found at shorter intervals. It might also be instructive

to examine the variables in the context of both production and verbal estimation methods of duration assessment.

Overall, however, the results of the present study supports the hypothesis that an inability to accurately estimate time passage may partially account for the origin and development of the Type A behavior pattern.

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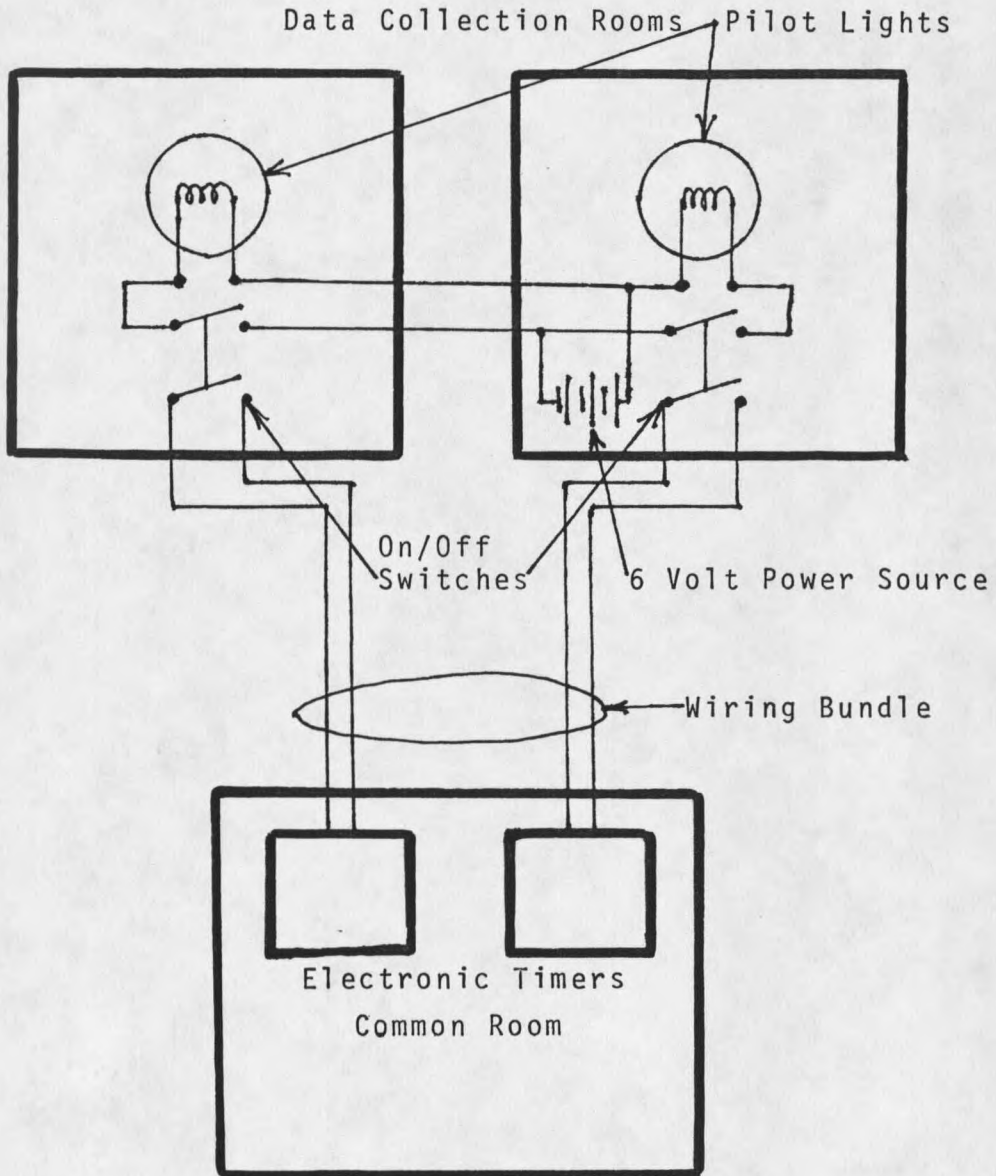
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Appendix A



Appendix B

Each of us belongs somewhere along the line between these two extremes. For example, most of us are neither the most competitive nor the least competitive person we know. What we would like you to do is make a vertical line where you think you belong between these two measures.

Never late _____	Casual about appointments
Not competitive _____	Very Competitive
Always rushed _____	Never feels rushed, even under pressure
Takes things one at a time _____	Tries to do many things at once/ thinks about what to do next
Fast (eating, walking etc,) _____	Slow doing things
"sits" on feelings _____	Expresses feelings
Many interests _____	Few interests outside of work
Name _____	Student ID no. _____
Phone no. _____	

