INTERNATIONAL JOURNAL OF BEHAVIORAL MEDICINE, *9*(2), 77–93


# Relation Between Type A Behavior Pattern and the Extent of Coronary Atherosclerosis in Japanese Women

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This study examined the relation of Type A behavior pattern and its components to angiographically documented coronary atherosclerosis in 198 Japanese women. A questionnaire-based interview elicited psychosocial and other factors. Type A behavior pattern was measured by 12 questions. Significant coronary stenosis was defined when a 75% or greater luminal narrowing occurred at one or more major coronary arteries or 50% or greater narrowing occurred at the left main artery. Gensini's score also was calculated. Logistic regression analysis was used to calculate odds ratios and 95% confidence intervals with adjustment for traditional coronary risk factors and the presence of a job. Global Type A behavior pattern showed no material association

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with the severity of coronary atherosclerosis assessed by both Gensini's score and the presence of significant coronary stenosis. However, its subcomponents, enthusiasm and competitiveness, were positively related to the severity of coronary atherosclerosis, whereas self-confidence and perfectionism were negatively related. These findings suggest overall a null association between global Type A and coronary atherosclerosis as well as the presence of toxic or beneficial components of Type A behaviors in Japanese women.

Key words: Japanese women, Type A behavior pattern, coronary angiography, coronary atherosclerosis, logistic regression analysis

Type A behavior pattern is regarded as a psychosocial risk factor for coronary heart disease (CHD; Rosenman, Brand, Sholts, & Friedman, 1976). Initial studies of Type A and CHD have focused on men, due in part to their greater morbidity and mortality rates. However, as an increasing number of women experience CHD, there is a correspondingly greater interest in research into the relation between Type A and CHD in women. Since the late 1970s, many studies have examined the relation between Type A and CHD or cardiovascular reactivity in women (Anderson & Lawler, 1995; Bass, 1984; Fichera & Andreassi, 1998; Haynes & Feinlieb, 1980; Haynes, Feinleib, Levine, Scotch, & Kannel, 1978; Stevens, Turner, Rhodewalt, & Talbot, 1984; William et al., 1980).

However, assessment of global Type A in women is confounded by the fact that women usually are socialized to avoid two components of Type A behavior: extreme competitiveness and the overt expression of anger (Campbell, 1999). This characteristic is considered true for Japanese women, who still depend greatly on their husbands (Shirahase, 2001). In fact, women who suppressed anger expression were shown to experience greater cardiovascular reactivity than women who expressed anger assertively (Anderson & Lawler, 1995). On the other hand, other studies have reported that hostility was associated with cardiovascular reactivity or coronary atherosclerosis in women (Fichera & Andreassi, 1998; Low et al., 1998), and there is presently no clear understanding of Type A and its relationship to CHD in women (Thoresen & Low, 1990).

Those studies, however, were performed in Western countries. There may be some cultural variances with regard to the components of the coronary-prone behavior pattern between Western and Japanese women. In studies of Japanese men, job-centered lifestyle and excessive work patterns rather than hostility or anger have been emphasized as coronary-prone behaviors (Hayano et al., 1997; Hosaka & Tagawa, 1987), whereas the role of hostility is rather evident as a risk factor for CHD in Western cultures (Shekelle, Gale, Ostfeld, & Paul, 1983; Williams et al., 1980). Of course, evidence shows that excessive work patterns (exhaustion) or time urgency is a risk also in Western countries (Cole, et al., 2001; Cole, Kawachi, Sesso,

Paffenbarger, & Lee, 1999; Weidner, 2000). On the other hand, despite these findings, the global effect of Type A is still considered more important than any other single component in Western cultures (Kawachi et al., 1998).

In Japan, although a few studies have examined the relation between Type A and CHD in male participants (Hori, Suzuki, & Hayano, 1994; Kayaba et al., 1990), almost nothing is known about the relation between Type A and CHD in women, and therefore coronary-prone behavior patterns of women are still unclear.

A brief questionnaire developed by Maeda (1991) is thought to be useful for Japanese people regardless of age, sex, or occupation. It was reported that this test was correlated with Type A described by a self-imaging test in Japanese women (Kimura, Shirasaki, & Watanabe, 2000). The purpose of this study was to investigate the relation between (a) global Type A behavior pattern as well as its subcomponents assessed by a questionnaire modified for Japanese characteristics and (b) the severity of angiographically documented coronary atherosclerosis in Japanese women.

## METHODS

### Participants

There were 838 eligible patients age 30 years or older undergoing coronary angiography for suspected or known ischemic heart disease for the first time at five hospitals in Fukuoka City and its suburbs from September 1996 to August 1997. The following patients were excluded in the study: those who had cardiac disease such as valvular disease, heart muscle disease, or myocardial infarction, and those who had undergone aorto-coronary artery bypass or percutaneous transluminal coronary angioplasty, because these disease conditions may have distorted lifestyle or psychosocial factors. A total of 733 patients (87.5%) participated in this study; 38 patients refused to participate in the study, 16 were severely ill, and 51 were discharged before the interview was arranged. All of the participants gave written informed consent. After we excluded all men ($n$ = 429), 304 women remained. We further excluded women having a deformity of the heart ($n$ = 1). To reduce recall bias associated with long-sustained clinical conditions, we also excluded those under treatment for angina pectoris for 6 months or more ($n$ = 13) and those whose episode leading to coronary angiography had lasted more than 1 year ($n$ = 68). These excluded patients did not differ from the remaining patients with regard to Type A characteristics and the extent of coronary stenosis. Finally, patients for whom information on relevant factors were incomplete were excluded ($n$ = 24). Thus, 198 women remained in the analysis.

## Assessment of Cardiac Risk Factors

A questionnaire-based interview elicited details of psychosocial factors, medical and family history, and lifestyle factors. Research physicians or nurses distributed the questionnaires to the participants before the angiographic procedure and collected them with interview. The interview was done before angiography ($n$ = 113) or after angiography ($n$ = 85), and interviewers were blinded with regard to the outcome of the angiography in the latter case. Participants were requested to answer questions regarding the previous factors before the occurrence of a symptom or an abnormal clinical test suggestive of CHD.

## Type A Behavior Pattern

Type A behavior pattern was assessed by an abbreviated set of 12 questions developed by Maeda (1991). This questionnaire was constructed based on the initial report regarding coronary-prone behaviors in Japanese people (Hasegawa, Kimura, & Sekiguchi, 1981), with reference to the characteristics described by Friedman and Rosenman (1959). This measure is considered to be very practical for epidemiological investigations in busy clinics because of its convenience. The questionnaire can be answered and evaluated very quickly, and the evaluations are not affected by the characteristics of referees. Each question is listed in the appendix. Diagnostic concordance for the global Type A behavior between the Japanese version of the Jenkins Activity Survey (JAS) and this 12-item questionnaire was reported to be 75%, and the 1-month reproducibility also was confirmed in 15 healthy working participants (agreement rate = 93%; Maeda, 1993).

Each question had three prepared answers: 2, 1, and 0 points were given to the answers of *always*, *occasionally*, and *hardly* for nine questions, and the points were doubled for three questions. Cronbach's alpha for Type A scale in our participants was 0.74. The total score of 17 or greater was defined as Type A according to the definition of Maeda (1991). To determine the cutoff point, Maeda (1991) compared 100 CHD patients with 150 men in a pharmaceutical company and 360 nursing students as control groups, and this cutoff point was considered to best distinguish the CHD group from the healthy group. In this study, reproducibility by test–retest method was assessed in 82 participants by mail and telephone interview with an interval of 3 to 6 months. Intraclass correlation coefficients of each item ranged from .30 to .61 (average .48), and the correlation coefficient was .67 for global Type A score. The scores of the each item were dichotomized, and the items answered with *always* or *occasionally* were compared with those answered by *hardly* as referent groups.

## Clinical Coronary Risk Factors

Participants were regarded as smokers if they had ever smoked even one cigarette every day for 1 year or longer. Likewise, alcohol use was defined as drinking alcohol at least once per week for 1 year or longer. Because of the few number of participants with alcohol consumption of 50 ml or more per day ($n$ = 2), the volume of alcohol consumption was not adjusted for in the multivariate analysis.

Laboratory data and medical treatments for hypertension, diabetes mellitus, and hyperlipidemia were extracted from medical records. Serum concentrations of total cholesterol, high-density lipoprotein cholesterol, and triglycerides as well as plasma glucose concentrations were measured at each hospital laboratory. Serum high-density lipoprotein cholesterol values were not available for some participants, and triglyceride concentrations were not always measured at a fasting state. Thus, these two variables were not taken into account in the analysis. History of hypertension was defined as positive if participants were under drug treatment for hypertension or if they had systolic blood pressure of 160 mm Hg or higher or diastolic blood pressure of 95 mm Hg or higher. Diabetes mellitus was defined as present when participants were under dietary or drug treatment for diabetes mellitus or when they had nonfasting plasma glucose of 200 mg/dl or higher measured at one hospital or fasting plasma glucose of 140 mg/dl or higher at the other four hospitals. Hyperlipidemia was defined as present when participants used a hypolipidemic drug or had serum total cholesterol of 220 mg/dl or greater. Height and body weight also were recorded, and a body mass index ($kg/m^2$) of 25 or greater was defined as overweight. Variables such as hypertension, diabetes mellitus, hyperlipidemia, and obesity were shown to be related to coronary artery disease (CAD) in participants similar to those in this study (Tanaka et al., 2001; Washio et al., 2001). The participants were regarded as workers if they had a full-time or part-time job.

## Coronary Angiography

Coronary artery luminal stenosis was assessed at each hospital in accordance with the American Heart Association method (Austen, 1975). The extent of narrowing of the luminal diameter was measured by calipers at one hospital and was approximated to 0%, 25%, 50%, 75%, 90%, 99%, or 100% at the other four hospitals. This assessment of coronary arteries was done blindly with respect to the psychosocial and other factors. Significant coronary stenosis was defined when a 75% or greater luminal narrowing occurred at one or more major coronary arteries or when a 50% or greater narrowing occurred at left main coronary artery. Gensini's score also was calculated as a measure of the severity of coronary atherosclerosis (Gensini, 1983). The coronary arteries were divided into 15 segments, and diseased segments were allotted 0.5 to 5 points depending on the

diameter of the normal vessel. Each point was multiplied by a severity score as follows: 1% to 25% stenosis (score 1), 26% to 50% (score 2), 51% to 75% (score 4), 76% to 90% (score 8), 91% to 99% (score 16), and 100% (score 32). The points for each segment were totaled to obtain a coronary atherosclerosis score. Participantss were divided into three groups in terms of the Gensini's score (0, 1–9.5, and 10+).

Agreement of arteriographic diagnosis among five hospitals was assessed by using a random sample of 10 angiograms in the series at one hospital. The presence of significant coronary stenosis was completely agreed among the five hospitals, and intraclass correlation coefficient of Gensini's score was 0.92.

### Statistical Analysis

Difference in coronary risk factors according to Type A behavior pattern was statistically tested by chi-square test or unpaired *t* test. Logistic regression analysis was used to adjust for potential confounding variables. Covariates included in the models were age, hospital, hypertension, diabetes mellitus, hyperlipidemia, overweight, cigarette smoking, alcohol intake, parental CHD (angina pectoris and myocardial infarction), and job. Age was categorized into three strata (<50, 50–69, and ³70). Furthermore, the presence of the angina-related symptoms such as chest pain, back pain, or irradiation pain was used as the outcome variable, as well as the severity of coronary atherosclerosis. In this analysis, the participants with angina-related symptoms were compared with those having no symptoms but an abnormal clinical test result among the participants without significant coronary stenosis ($n$ = 150). Indicator variables were created for categories of the covariates, and adjusted odds ratios (OR) and 95% confidence intervals (CI) were obtained from the corresponding logistic regression coefficient and their standard errors. Reported $p$ values are always two-sided. All computations were performed by using the SAS software Version 6.04 (SAS Institute, Cary, NC, USA).

## RESULTS

Of the 198 participants, 48 (24%) had significant coronary stenosis. Mean age was 65.7 years ($SD$ = 10.1). Prevalence of Type A behavior pattern was 36%. Twenty-one percent of the participants had a full-time job, 10% had a part-time job, and 69% had no paid occupation. Regarding traditional coronary risk factors, there was no material difference between those with Type A and without with the exceptions that participants with Type A were younger than those without Type A ($p$ = .07) and that frequencies of alcohol use ($p$ = .08) and working ($p$ = .001) were higher among those with Type A than those without Type A.

Table 1 shows the frequencies of each item's responses. The frequencies of the positive responses were relatively low for the questions of busy life, time urgency, rigidity, intense temper, and competition. In contrast, perfectionism, self-confidence, and tension showed high frequencies of the positive responses.

Pearson's correlation coefficients of each single item to whole Type A behavior are shown in Table 2. Perfectionism, self-confidence, and punctuality showed relatively high correlations with global Type A score, whereas the correlation between Type A and time urgency or rigidity was poor.

Tables 3 and 4 represent the relation between the subcomponents of Type A and the severity of coronary atherosclerosis assessed by significant stenosis and Gensini's score, respectively. In Table 4, the participants with 10+ score were compared with those with 0 score as controls. Perfectionism and self-esteem were statistically significantly or nearly significantly associated with a decreased risk of CAD. In contrast, enthusiasm was statistically significantly associated with an increased risk of coronary stenosis even after we adjusted for other confounding variables (Table 3). A similar tendency was observed when Gensini's score was used (Table 4). Competitiveness was nearly significantly ($p = .087$) associated with an increased risk of significant stenosis.

Table 5 summarizes the relation between global Type A behavior pattern and the risk of coronary atherosclerosis as defined by the presence of significant stenosis and Gensini's score. Although Type A was related to a modest, statistically nonsignificant increase in the risk of coronary atherosclerosis as defined by the presence of significant stenosis, adjusted ORs associated with Type A were slightly lower than unity regardless of adjustment for cardiac risk factors when we used

TABLE 1
Frequency (%) of Each Item's Response on the Type A Questionnaire: 198 Female Participants

| *Abbreviated Statement (No)* | *Always* | *Occasionally* | *Hardly* |
|---|---|---|---|
| Busy life (1) | 23.7 | 24.7 | 51.5 |
| Time urgency (2) | 18.2 | 23.7 | 58.1 |
| Enthusiasm (3) | 29.3 | 29.8 | 40.9 |
| Rigidity (4) | 12.6 | 14.1 | 73.2 |
| Perfectionism (5) | 49.0 | 28.3 | 22.7 |
| Self-confidence (6) | 47.0 | 35.9 | 17.2 |
| Tension (7) | 48.0 | 35.9 | 16.2 |
| Anger (8) | 20.2 | 39.9 | 39.9 |
| Punctuality (9) | 42.4 | 33.3 | 24.2 |
| Unyieldingness (10) | 34.3 | 28.3 | 37.4 |
| Intense temper (11) | 20.2 | 28.3 | 51.5 |
| Competitiveness (12) | 11.6 | 20.7 | 67.7 |

TABLE 2
Pearson's Correlation Coefficients Between Global Type A and Each Item

| | |
|---|---|
| Busy Life (1) | .45 |
| Time urgency (2) | .38 |
| Enthusiasm (3) | .51 |
| Rigidity (4) | .31 |
| Perfectionism (5) | .72 |
| Self-confidence (6) | .58 |
| Tension (7) | .43 |
| Anger (8) | .50 |
| Punctuality (9) | .63 |
| Unyieldingness (10) | .52 |
| Intense temper (11) | .48 |
| Competitiveness (12) | .43 |

TABLE 3
Relation Between Items of Type A Behavior Pattern and Significant Coronary Stenosis[a]

| | *Age-Adjusted* | | *Fully Adjusted*[b] | |
|---|---|---|---|---|
| *Abbreviated Statement (No)* | *OR* | *95% CI* | *OR* | *95% CI* |
| Busy life (1) | 0.5 | 0.2–1.0 | 0.7 | 0.3–1.6 |
| Time urgency (2) | 1.0 | 0.5–2.1 | 1.3 | 0.6–2.9 |
| Enthusiasm (3) | 2.1* | 1.0–4.4 | 2.5* | 1.1–5.8 |
| Rigidity (4) | 0.6 | 0.2–1.3 | 0.5 | 0.2–1.2 |
| Perfectionism (5) | 0.4* | 0.2–0.8 | 0.6 | 0.3–1.4 |
| Self-confidence (6 | 0.5 | 0.2–1.1 | 0.5 | 0.2–1.3 |
| Tension (7) | 1.0 | 0.4–2.5 | 2.2 | 0.7–6.8 |
| Anger (8) | 0.7 | 0.4–1.5 | 0.8 | 0.4–1.6 |
| Punctuality (9) | 1.4 | 0.6–3.1 | 1.5 | 0.6–3.8 |
| Unyieldingness (10) | 1.1 | 0.6–2.3 | 1.1 | 0.5–2.5 |
| Intense temper (11) | 0.9 | 0.4–1.7 | 0.9 | 0.4–2.0 |
| Competitiveness (12) | 1.6 | 0.8–3.4 | 2.2 | 0.9–5.2 |

*Note.* OR = odds ratio; CI = confidence interval.
[a]N = 198. [b]Adjusted for age, hospital, hypertension, diabetes mellitus, hyperlipidemia, overweight, cigarette smoking, alcohol intake, parental coronary heart disease, and job.

Gensini's score as the dependent variable, although the decreases were not statistically significant. Further analysis with Type A score as the continuous variable did not show any material association between global Type A and significant stenosis (adjusted OR 1.2, 95% CI 0.6–2.3). Again, there was no substantial association between global Type A and angina-related symptoms in the participants without significant coronary stenosis (adjusted OR 0.8, 95% CI 0.2–3.2).

TABLE 4
Relation Between Each Items of Type A Behavior Pattern and Severity of Coronary Atherosclerosis Assessed by Gensini's Score[a]

| | *Age-Adjusted* | | *Fully Adjusted*[a] | |
|---|---|---|---|---|
| *Abbreviated Statement (No)* | *OR* | *95% CI* | *OR* | *95%* |
| Busy life (1) | 0.5 | 0.2–1.2 | 0.5 | 0.2–1.6 |
| Time urgency (2) | 0.9 | 0.4–2.1 | 0.9 | 0.3–2.3 |
| Enthusiasm (3) | 1.8 | 0.8–4.1 | 2.0 | 0.7–5.3 |
| Rigidity (4) | 0.5 | 0.2–1.4 | 0.3 | 0.1–1.1 |
| Perfectionism (5) | 0.4* | 0.2–1.0 | 0.5 | 0.2–1.6 |
| Self-confidence (6) | 0.4 | 0.2–1.0 | 0.2* | 0.1–0.7 |
| Tension (7) | 0.8 | 0.3–2.5 | 2.4 | 0.5–10.8 |
| Anger (8) | 0.7 | 0.3–1.6 | 0.8 | 0.3–1.9 |
| Punctuality (9) | 1.0 | 0.4–2.5 | 0.6 | 0.2–1.8 |
| Unyieldingness (10) | 0.9 | 0.4–2.0 | 1.0 | 0.4–2.5 |
| Intense temper (11) | 0.8 | 0.4–1.7 | 0.6 | 0.2–1.6 |
| Competitiveness (12) | 1.7 | 0.7–4.0 | 2.2 | 0.8–6.4 |

*Note.* OR = odds ratio; CI = confidence interval.

[a]$N = 132$. [b]Adjusted for age, hospital, hypertension, diabetes mellitus, hyperlipidemia, overweight cigarette smoking, alcohol intake, parental coronary heart disease, and job.

*$p < 0.05$.

TABLE 5
Relation Between Global Type A Behavior Pattern and Severity of Coronary Atherosclerosis

| | | | *Age-Adjusted* | | *Fully Adjusted*[a] | |
|---|---|---|---|---|---|---|
| *Factor* | *No. of Women* | | *OR* | *95% CI* | *OR* | *95% CI* |
| Type A | Stenosis | No stenosis | | | | |
| Absent | 32 | 94 | 1.0 | — | 1.0 | — |
| Present | 16 | 56 | 1.0 | 0.5–1.9 | 1.8 | 0.8–4.1 |
| Type A | $0 < GS^b < 10$ | GS = 0 | | | | |
| Absent | 44 | 52 | 1.0 | — | 1.0 | — |
| Present | 22 | 39 | 0.7 | 0.3–1.3 | 0.8 | 0.4–1.8 |
| Type A | $10 \leq GS$ | GS = 0 | | | | |
| Absent | 30 | 52 | 1.0 | — | 1.0 | — |
| Present | 11 | 39 | 0.5 | 0.2–1.2 | 0.6 | 0.2–1.8 |

*Note.* OR = odds ratio; CI = confidence interval; GS = Gensini's score.

[a]Adjusted for age, hospital, hypertension, diabetes mellitus, hyperlipidemia, overweight cigarette smoking, alcohol intake, parental coronary heart disease, and job.

## DISCUSSION

### Overall Association and Negative Findings

In this study, global Type A behavior pattern was not statistically significantly associated with the severity of coronary atherosclerosis defined by both the presence of significant stenosis and Gensini's score. However, in the analyses regarding subcomponents of Type A, some items were statistically significantly associated with an increased risk, and some were associated with a decreased risk of CAD.

Previous studies are inconsistent with regard to the relation between Type A and angiographically documented CAD, as is the case with studies of CHD incidence and mortality. Although several studies reported a positive association between Type A and CAD (Blumenthal, Williams, Kong, Schanberg, & Thompson, 1978; Frank, Hellar, Kornfeld, Sporn, & Weiss, 1978; Krantz, Sanmarco, Selvester, & Matthews, 1979; Zyzanski, Jenkins, Ryan, Flessas, & Everist, 1976), others failed to find such an association (Bass & Wade, 1982; Dimsdale et al., 1978; Krantz et al., 1981; Scherwitz et al., 1983; Young, Barboriak, Anderson, & Hoffman, 1980). Japanese studies also reported inconsistent results regarding the relation between Type A and CAD (Hori et al., 1994; Maeda, 1991; Maeda & Ito, 1990; Tagawa & Hosaka, 1990). Recent studies on Japanese male workers (Hayano et al., 1997; Yoshimasu et al., 2000) showed that Type A was associated with a decreased risk of CAD. However, these studies either used only male participants or included very few women. William et al. (1988) studied 2,289 participants, including 679 women, and concluded that the inconsistency may be due to the use of different tools for assessing Type A, inadequate sample size, or different characteristics of study participants.

This study showed that global Type A was associated with only minimal, nonsignificant decreases in the risk of coronary atherosclerosis assessed by Gensini's score. This is consistent with the results of other studies on male workers (Hayano et al., 1997; Yoshimasu et al., 2000). These findings may be due to the characteristics of components that are fit to the cultural standards. In modern society, where working hard or feeling time urgency is common, Type B behavior pattern may be stressful compared with Type A, because it cannot be well adapted to the general culture. In this study, perfectionism and self-esteem were statistically significantly associated with a decreased risk of CAD. These behaviors can be considered to be an advantage in modern society and to moderate mental tension.

In Japanese male workers, a job-centered lifestyle, or a tendency to value jobs above family or other activities, was specifically shown to be a coronary-prone behavior (Hayano et al., 1997). Self-esteem, perfectionism, and rigidity may be related to such a workaholic behavior pattern. On the other hand, self-esteem can be regarded as a positive feeling. It was reported that women, regardless of Type A, exhibited a great cardiovascular reactivity when they were

confronted with perceived threats to their self-esteem (Anderson & Lawler, 1995). Perfectionism rather than sloppiness also occasionally leads to good evaluation by one's friends and acquaintances. In fact, Type A assessed by this measure was positively associated with friendly relationships with other people for Japanese women (Kimura et al., 2000). Thus, some components included in this Type A measure may have preventive effects against CHD in modern society, especially in women.

In addition, busy life and time urgency were not associated with CAD at all. These characteristics have been considered important in Japanese culture (Oishi et al., 1999; Yamasaki & Kikuno, 1990). In summary, these results showed that there was no positive association between Type A and CAD in Japanese women.

## Study Limitations

Our findings must be interpreted with caution because of several methodological problems.

First, mean age of the participants was no less than 65 years. William et al. (1988) reported that Type A participants had more severe CAD than did Type Bs among those age 45 or younger, and the relation was reverse among those age 55 and older. In addition, only 31% of these participants had a full-time or part-time job, whereas the Framingham study (Haynes & Feinleib, 1980; Haynes et al., 1978) showed a positive association between Type A and working in women. The observed low frequencies of busy life and time urgency in this study may be mainly due to this effect. The social background of the participants may have attenuated the relation between Type A and CAD in our study.

Second, selection bias is a serious concern in studies based on patients undergoing coronary angiography (Pickering, 1985). Although it has been reported that the association with traditional coronary risk factors observed in such patients is not biased seriously, psychosocial factors may be more susceptible to selection bias because patients with coronary angiography may be chosen due to the presence of psychosocial traits. Type A participants may be, because of their punctuality, sensitive to trifling physical disorders, and this may lead their physicians to refer them more readily for angiography. Especially in the women with perfectionism, this could be expected. In this study, no less than 76% of the participants did not have significant CAD, and thus it is most likely that Type A individuals were overrepresented among those without CAD. This type of selection bias tends to attenuate the true, positive association rather than to result in a spurious positive association. Therefore, the observed null association between Type A and CAD may be underestimated.

In this regard, we should note that women have higher prevalence than men of microspastic angina and of microvascular angina (Cannon, Camici, & Ep-

stein, 1992; Douglas, 1997; Sullivan et al., 1994), both of which are associated with atypical chest pain patterns. Type A may be related to these diseases even if it is not associated with CAD of major coronary arteries. Although Type A was not associated with the angina-related symptoms in this study, the controls used in this comparison all had known or suspected CHD suggested by abnormal clinical tests. Completely healthy controls and participants with angina-related symptoms should be compared with regard to this matter.

Third, although a high correlation between Type A assessed in this study and JAS was reported (Maeda, 1991), the measure of Type A used here may not have represented Type A assessed by the structured interview. In fact, Type A assessed by JAS was not much correlated with a Japanese version of the structured interview in women (Mono, Haney, Williams, Blumenthal, & Shirakawa, 1991).

Last, this study did not ascertain the participants' menopausal status and use of hormone replacement therapy. Estrogen appears to be antiatherogenic, and more Type A women choose estrogen replacement after menopause than non–Type A women (Matthews, Kuller, Wing, Meilahn, & Plantinga, 1996). Therefore, the associations between Type A behavior and atherosclerosis may be attenuated by hormone replacement therapy in postmenopausal women. This is expected in our study, because most of the participants were considered to be postmenopausal. Because Type A behavior was more frequent in younger women, it is likely that any premenopausal women in this study would have higher scores on Type A than postmenopausal women. This also may explain the null association between Type A and CAD in our study, because premenopausal women would be expected to have a milder degree of atherosclerosis than postmenopausal women.

## Positive Findings

In this study, a tendency to be enthusiastic was found to be pathogenic for CAD. Enthusiasm sometimes helps one deal with one's job very efficiently, and in that sense, it can be considered beneficial. However, it is often connected with being quick-tempered rather than composed and could be related to hard-driving component of Type A. Enthusiasm also can be regarded as a kind of overcommitment, defined as a personal pattern of coping with demands characterized by excessive striving in combination with a strong desire to be approved and esteemed. Joksimovic et al. (1999) showed that overcommitment predicted restenosis after coronary angioplasty in cardiac patients.

It also was reported that high intrinsic effort (immersion) was related to increased low-density lipoprotein cholesterol in study of Swedish women (Peter et al., 1998).

Although women, especially those who don't work outside the home, are generally considered to be less competitive than men (Thoresen & Low, 1990), com-

petitiveness was found to be pathogenic in this study. We can suppose that competitiveness is more stressful in family or neighborhood environments rather than in the workplace, because homemakers with competitive home environments must be worried all the time, for instance, by conflicts with a daughter-in-law or mother-in-law, which is a traditional problem in the Japanese family. In the Western study, it also was reported that anger over autonomy issues, striving to maintain control of power, was associated with systolic blood pressure reactivity in Type A women (Anderson & Lawler, 1995).

However, again, we should be careful in interpreting these positive associations between some items of Type A and CAD, because these items had low correlation with global Type A, and only one item was statistically significantly associated with CAD, which means that the positive association can occur occasionally.

## CONCLUSION

In this study we examined the relation between Type A behavior pattern and angiographically documented CAD in Japanese women and showed that global Type A was not at all associated with the severity of coronary atherosclerosis. On the other hand, enthusiasm and competition were shown to be pathogenic for CAD, and self-confidence and perfectionism were associated with a decreased risk of CAD. Further studies are warranted regarding the role of psychosocial factors in coronary atherosclerosis and thrombogenesis in Japanese women.

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## APPENDIX
### Questions in Maeda's Questionnaire for Type A Behavior Pattern

1. Do you have a busy daily life?
2. Do you feel being pressed for time in your daily life?
3. Do you easily become enthusiastic over your job or other things?
4. When you are absorbed in your job, do you find it difficult to change your mind?
5. Are you a perfectionist?
6. Do you have confidence in yourself?
7. Do you easily feel tense?
8. Do you easily feel irritated or angry?
9. Are you punctual with everything?
10. Are you unyielding?
11. Do you have an intense temper?
12. Do you easily become competitive about job or other things?