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Original Article

Does Behavior Pattern Influence Blood Pressure in the Current Cultural Context of Japan?

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Abstract

Background: Type A behavior pattern has been presented as a risk for coronary heart disease and defined as a psychological-behavioral construct. This study aimed to identify the influence of type A behavior pattern on blood pressure in the current cultural context of Japan.

Methods: This study utilized a cross-sectional design. Self-administered questionnaires were distributed to community residents aged 40-59 yr in western Japan from Aug to Sep 2017. The data included participant's demographic information (including socioeconomic variables); information related to blood pressure, type A behavior pattern, psychological factors, and health-related behaviors. Logistic regression was used to identify the influence of type A behavior pattern on systolic blood pressure after adjusting for behavioral, psychological, and socioeconomic factors.

Results: The sample included 362 participants with a mean age of 51.5 years (*SD* = 5.96); 148 (41.2%) men. A logistic regression demonstrated that type A behavior pattern was negatively associated with systolic blood pressure (OR = 0.43, 95% CI [0.22, 0.83]) after adjusting for sex and age. Similar results were observed after adjusting for other covariates.

Conclusion: There may be a negative association between type A behavior pattern and systolic blood pressure among adults living in the current cultural context of Japan.

Keywords: Coronary prone behavior; Blood pressure; Communities; Culture; Middle age

Introduction

Cardiovascular disease (CVD) is a leading cause of death both worldwide (1) and in Japan, with hypertension being a major prodromal symptom of CVD (2).

In addition to traditionally identified risk factors, such as dietary salt intake (3) and alcohol consumption (4), psychological factors are also associated with hypertension. One risk factor is type A behavior pattern initially presented by Friedman and Rosenman as a construct related to coronary heart disease (5). Type A behavior pattern has been defined as a psychological-behavioral construct that is characterized by enhanced aggressiveness, ambitiousness, competitive drive, and a chronic sense of time urgency (5). The type A behavior pattern may cause hyperreactivity of

the autonomic nervous system or endocrine system when a person responds to stress (6), and the frequency or continuation of this hyperreactivity is related to hypertension.

The relationship between type A behavior pattern and CVD has been demonstrated in several cohort studies (5, 7). However, other subsequent research demonstrated the absence of a relationship between type A behavior pattern and CVD (8,9). Nevertheless, these studies had methodological challenges, such as measurement limitations for the type A behavior patterns or generalizability of the study samples (10). In addition, a meta-analysis of laboratory research reported that there was a significant relationship between type A behavior pattern and hyper-activation of the cardiovascular response, such as elevated blood pressure (11). Furthermore, individuals who exhibit type A behavior pattern (type A people) are more likely to suffer from hypertension than individuals who do not exhibit type A behavior pattern (non-type A people) (12). Type A behavior pattern is one of the primary psychological factors associated with hypertension.

While prior research has demonstrated a relationship between type A behavior pattern and hypertension, most studies have been conducted in Western countries. The influence of the type A behavior pattern vary across cultural contexts (13). Results of studies exploring the relationship between the type A behavior pattern and blood pressure in Japan have yielded inconsistent results (14,15). In addition, mechanisms in society and societal values have changed since the 1960s and 1970s when numerous large-scale epidemiologic studies on type A behavior pattern were conducted. In Japan, results-oriented evaluation has been introduced, and the prevalence of death from overwork has increased. Given these factors, the influence of type A behavior pattern on blood pressure may change depending on the cultural context and over time. Thus, the identification of the influence of type A behavior pattern on blood pressure in the current non-western country would be beneficial.

The aim of the current study was to identify the relationship between type A behavior pattern and blood pressure in middle-aged residents in Japan.

Materials and Methods

Study Design and Participants

This cross-sectional study was carried out in a rural municipality in western Japan with a population of about 6500. The participants were all residents aged 40 to 59 who were listed in the basic resident register of the municipality. There were 1310 residents aged 40 to 59 living in the municipality. Of these, 101 residents were excluded from recruitment. The exclusion criteria were 1) residents who had mental and physical disabilities, 2) residents who were living in a nursing home and 3) residents who were listed in the basic resident register of the municipality, but did not live in the municipality. Thus, we distributed the questionnaire survey including an explanation about the survey to 1209 residents.

Data Collection

The data were collected from Aug to Sep 2017 using a survey that was returned through post mail. Contents of the questionnaire were (a) demographic characteristics and blood pressure information, (b) psychological factors, (c) health-related behaviors, and (d) socioeconomic factors.

Measures

Demographic characteristics and blood pressure

Demographic characteristics (e.g., sex, age, living arrangement, and occupation) and blood pressure were obtained. Systolic blood pressure was divided at 130 mm Hg into two groups (high-blood pressure and low-blood pressure).

Psychological factors

To assess the type A behavior pattern, we used a self-report questionnaire that was developed by Maeda (16). The scale of type A behavior pattern has been translated into Japanese and has been validated in Japanese samples (16). This instru-

ment consists of 12 items related to components of type A behavior, such as the sense of time urgency, irritability, and aggressiveness. Each item is rated on a three-point Likert scale ranging from 2 (*usually*) to 0 (*hardly ever*) with a double score given to the three items. The scores ranged from 0 to 30, and higher scores indicate a greater tendency to exhibit the type A behavior pattern. The author recommends a cut-point score of 17 or more to identify those whose behavior is consistent with the type A behavior pattern. In our sample, Cronbach's α was .75. We used the cut-point score to divide our sample into two groups (i.e., Type A and non-Type A).

The Sense of Coherence (SOC), University of Tokyo Health Sociology version of original three-item Sense of Coherence Scale Ver1.2 (SOC3-UTHS) (17) was used. The SOC3-UTHS consists of three items related to the subordinate concepts of SOC such as manageability, comprehensibility, and meaningfulness. The SOC3-UTHS has been translated into Japanese and has been validated in Japanese samples (18). Each item is rated on a 7-point rating scale from 1 (not present) to 7 (maximally present), with scores ranging from 3 to 21, and higher score indicate stronger SOC. For this study, the Cronbach's α was .88. We divided participants into two groups using the mean score of SOC3-UTHS, which was 14, (i.e., High-SOC and Low-SOC).

To assess depression, the Hospital Anxiety and Depression scale (HADS) (19,20) was used. The HADS is designed to assess depressive symptoms with seven items. Each item is scored on a scale from 0 (not present) to 3 (maximally present), with total scores ranging from 0 to 21. Higher score indicates a higher level of depression. Scoring guidelines recommend that a cut-point score of 7 or less is suggestive of being non-depressed, scores of 8–10 is for doubtful cases, and scores of 11 or more for definite depression. The HADS has been translated into Japanese and has been validated (21). In the present study, the Cronbach's α was .75. HADS was divided into two groups at a cut-point score of 8 (i.e., depressed and non-depressed).

To assess cognitive stress, the respondents rated their level of subjective cognitive stress. The item was rated on a four-point scale ranging from 1 (*very much*) to 4 (*not at all*). Subjective stress was divided into two groups (High-Stress, high to moderate score, and Low-Stress, moderate to zero score).

To assess stressors, we assessed the stressful life events that were experienced by respondents for the past year, based on a method used in a previous study (22). The stressful life events included the following: "Change in family member," "Troubles with boss or co-workers," "Troubles with family members," "Major personal injury or illness," "Major change in social activities," "Psychosomatic overwork," "Change to another company or retirement from work," and "Major change in health or behavior of family member." Based on the distribution of the data, we then divided the sample by the number of stressful life events, using the threshold of two life events, to create two groups (i.e., many life events and few life events).

Health-related behavior

To assess health related behavior, items from Berkman's health-related behavior (23) were asked (e.g., frequency of drinking alcohol, smoking habits, frequency of exercise, sleeping pattern, weight, and height). Body mass index (BMI) was calculated as weight (kg) divided by the square of height (m). The frequency of drinking alcohol was divided into two groups (i.e., Everyday Drinker and Non-Everyday Drinker). Smoking habits was divided into two groups with the Non-smoker group including those who reported that they had "never smoked" and the smoker group being those who had "ever smoked or currently smoked." The frequency of exercise was divided into two groups the High-exercise group being those who exercised "once or more per week" and Low-Exercise group being those who exercised, "less than once per week." Sleeping patterns were divided into two groups (i.e., 7 or 8 h of sleep and ≤ 6 or ≥ 9 h of sleep). BMI was divided into two groups, Moderate BMI (BMI ≥

18.5 and < 25) and Not-Moderate BMI (BMI <18.5 or ≥ 25).

To assess stress management practices, participants were asked to rate the stage of change in their stress management practices based on ratings used in a previous study (24). Participants selected their response from the following five options: 1) Precontemplation (i.e., not intending to begin); 2) Contemplation (i.e., intending to begin in the next 6 months); 3) Preparation (i.e., intending to begin in the next 30 d); 4) Action (i.e., practicing the behavior, but for less than 6 months); or 5) Maintenance (i.e., practicing the behavior for at least 6 months). Stress management practices were then divided into two groups (i.e., the Practice group, those in the Action or Maintenance stages, and Non-Practice group, those in all other stages of change).

Socioeconomic Factor

To assess social capital, six items were asked based on the methods used in a previous study (25). Each item is related on four-point scale ranging from 1 (*unsuitable*) to 4 (*suitable*). The total scores range from 6 to 24, and higher scores indicate more social capital. The Cronbach's α in this study was .72. Social capital was divided into two groups at the mean score (M = 18; High Social Capital and Low Social Capital).

To assess economic status, subjective economic conditions was rated. The item is rated on a 4-point scale ranging from 1 (*comfortable*) to 4 (*bad*). Subjective economic conditions were divided into two groups (i.e., Financially comfortable, ratings of "comfortable or a little comfortable" or Non-financially comfortable, "a little bad or bad").

Statistical analysis

Descriptive statistics were used to analyze characteristics of subjects. A logistic regression analysis was performed by converting the variables into dummy variables except for the variable of participant age. Logistic regression analysis was performed to identify the effect of type A behavior pattern on systolic blood pressure after adjusting behavioral, psychosocial, and socioeconomic factors. All of the covariates were entered into the model simultaneously. In Model 1, type A behavior pattern was used as explanatory variable, and demographic characteristics were entered into the model as covariate variables. In Model 2, health-related behaviors and stress management practice were entered into the model as additional covariate variables. In Model 3, psychological factors were entered into the model as additional covariate variables. In Model 4, socioeconomic factors were entered into the model as additional covariate variables. All statistical analyses were conducted with SPSS (ver. 25.0, Chicago, IL, USA).

Ethical Considerations

The questionnaire survey (unsigned questionnaire) was conducted to grasp actual conditions of residents and to make policy for health promotion by a municipality. In this study, we received and analyzed this data, but the data did not include information that could identify individual subjects. We received informed consent from the person in charge of the municipality who provided permission to use the data for secondary analysis. In addition, the information about this study was presented on homepage of author's institution, and the poster about this study was displayed at the public municipal office for the participants. The ethical committee of the author's institute approved this study.

Results

Participant Characteristics

Of 393 participants (recovery rate was 32.5%) who returned the survey, 31 participants refused to answer the questionnaire. The final analytic sample included 362 participants. Table 1 shows the participants' characteristics. The mean age of participants was 51.5 yr (SD = 5.96) with 148 (41.2%) men and 211 (58.8%) women.

Table 1: Participant Characteristics

Variables	*Category*	n *(%)*
Demographic characteristics		
Sex	Men (1) / Women (0)	148 (41.2%) / 211 (58.8%)
Living arrangements	Living alone	35 (9.8%)
	Living with spouse	68 (19.0%)
	Living with spouse and Child(ren)	84 (23.5%)
	Living with multiple generations	136 (38.0%)
	Other	35 (9.7%)
Occupation	Full-time job	183 (51.4%)
	Self-employed	42 (11.8%)
	Part-time job	88 (24.7%)
	Homemaker	18 (5.1%)
	Other	25 (7.0%)
Systolic blood pressure	High blood pressure (1) / Low blood pressure (0)	90 (28.8%) / 222 (71.2%)
Psychological factors		
Type A behavior Pattern	Type A (1) / Non-Type A (0)	91 (26.0%) / 259 (74.0%)
Sense of coherence	High SOC (1) / Low SOC (0)	235 (66.0%) / 121 (34.0%)
Depression	Depressed (1) / Non- depressed (0)	114 (32.9%) / 232 (67.1%)
Subjective stress	High stress (1) /Low stress (0)	253 (71.3%) / 102 (28.7%)
Life events	Many life Events (1) / Few life events (0)	198 (54.7%) / 164 (45.3%)
Health-related behaviors		
BMI	Moderate (1) / Not moderate (0)	235 (68.5%) / 108 (31.5%)
Alcohol consumption Habits	Non-everyday drinker (1) / Everyday drinker (0)	257 (72.2%) / 99 (27.8%)
Smoking	Non-smoker (1) / smoker (0)	205 (57.7%) / 150 (42.3%)
Exercise	High exercise (1) / Low exercise (0)	104 (29.2%) / 252 (70.8%)
Sleeping patterns	7 or 8 h (1) / others (0)	59 (16.6%) / 297 (83.4%)
Stress management	Practice (1) / Non-practice (0)	139 (40.9%) / 201 (59.1%)
Socioeconomic Factor		
Social Capital	High social capital (1) / Low Social capital (0)	224 (63.6%) / 128 (36.4%)
Subjective Economic Conditions	Comfortable (1) / Non-comfortable (0)	199 (55.7%) / 158 (44.3%)

Effects of Type A Behavior on Systolic Blood Pressure

Table 2 shows the results of the logistic regression analyses. In Model 1, the logistic regression analysis showed that type A behavior pattern was negatively associated with systolic blood pressure (OR=0.43, 95% CI [0.22, 0.83], *P*=.012) after adjusting for sex and age. Similar results were observed in Model 2 to Model 4 (Model 2: OR=0.35, 95% CI [0.17, 0.72], *P*=.004; Model 3: OR=0.28, 95% CI [0.13, 0.62], *P*=.002; Model 4: OR=0.27, 95% CI [0.12, 0.61], *P*=.002). Nagelkerke R^2 of each model were 8% (Model 1), 16% (Model 2), 19% (Model 3), and 20% (Model 4).

Table 2: Multivariate Logistic Regression Analysis for Identifying Relationships between Systolic Blood Pressure and Type A Behavior Pattern

Variables	***Category***	***Model 1***			***Model 2***			***Model 3***			***Model 4***		
		OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*
Type A behavior Pattern	Type A (1) / Non-Type A (0)	0.43	0.22, 0.83	.012	0.35	0.17, 0.72	.004	0.28	0.13, 0.62	.002	0.27	0.12, 0.61	.002
Demographic characteristics													
Age (years)		1.03	0.99, 1.08	.189	1.04	0.99, 1.09	.100	1.05	0.99, 1.10	.083	1.05	1.00, 1.11	.059
Sex	Men (1) / Women (0)	2.21	1.31, 3.73	.003	1.53	0.75, 3.13	.240	1.54	0.73, 3.30	.260	1.52	0.72, 3.23	.275
Health-related behaviors													
BMI	Moderate (1) / Not moderate (0)				0.42	0.23, 0.75	.004	0.42	0.23, 0.77	.005	0.42	0.23, 0.77	.005
Alcohol consumption Habits	Non-everyday drinker (1) / Everyday drinker (0)				0.47	0.24, 0.90	.023	0.48	0.24, 0.94	.033	0.47	0.24, 0.94	.033
Smoking	Non-smoker (1) / smoker (0)				1.05	0.51, 2.14	.895	1.04	0.49, 2.22	.910	1.07	0.50, 2.28	.866
Exercise	High exercise (1) / Low exercise (0)				1.16	0.63, 2.15	.633	1.20	0.63, 2.30	.581	1.27	0.66, 2.47	.473
Sleeping patterns	7 or 8 h (1) / others (0)				1.25	0.61, 2.58	.548	1.23	0.58, 2.62	.596	1.33	0.62, 2.87	.471
Stress management	Practice (1) / Non-practice (0)				0.61	0.34, 1.10	.099	0.58	0.31, 1.09	.092	0.60	0.32, 1.13	.116
Psychological factors													
Sense of coherence	High SOC (1) / Low SOC (0)							1.53	0.78, 2.98	.216	1.53	0.77, 3.02	.222
Depression	Depressed (1) / Non- depressed (0)							2.11	1.09, 4.11	.027	1.97	1.00, 3.85	.049
Subjective stress	High stress (1) /Low stress (0)							1.18	0.59, 2.39	.638	1.12	0.55, 2.30	.752
Life events	Many life Events(1) / Few life events (0)							0.89	0.48, 1.64	.703	0.89	0.48, 1.64	.701
Social Capital	High social capital (1) / Low Social capital (0)										0.89	0.48, 1.65	.704
Subjective Economic Conditions	Comfortable (1) / Non-comfortable (0)										0.63	0.35, 1.15	.133

Notes. Model 1: Hosmer and Lemeshow test: $\chi^2 = 5.852$, $P = .664$, Nagelkerke $R^2 = 8\%$; Model 2: Hosmer and Lemeshow test: $\chi^2 = 6.529$, $P = .588$, Nagelkerke $R^2 = 16\%$; Model 3: Hosmer and Lemeshow test: $\chi^2 = 2.727$, $P = .950$, Nagelkerke $R^2 = 19\%$; Model 4: Hosmer and Lemeshow test: $\chi^2 = 5.836$, $P = .666$, Nagelkerke $R^2 = 20\%$. 95% CI, 95% confidence interval; OR, odds ratio

Discussion

The present study demonstrated the presence of a negative association between type A behavior pattern and systolic blood pressure after adjusting for behavioral, psychological, and socioeconomic factors in a sample of middle-aged adults living in Japan.

Previous research in Western counties has shown that type A behavior pattern is related to high blood pressure (12), but this study found the opposite results. This is consistent with a previous study conducted in Japan, which indicated that non-type A behavior pattern is related to a high incidence rate of coronary heart disease (14). Non-type A behavior pattern is related to high blood pressure while our results suggest that non-type A behavior pattern was associated with an increased likelihood of CVD in the Japanese population. The likelihood of the influence of type A behavior pattern on blood pressure or CVD might vary depending on the cultural context.

There are two possible explanations for the association between type A behavior pattern and low blood pressure in our sample. First, in the Japanese culture where the strong sense of belonging to a social group and the unity of social group are emphasized, the toxic aspect of type A behavior pattern is neutralized. Type A individuals may experience intense emotional reactions and continue to strive to solve the problems when they are in an uncontrolled situation (26). The type A behavior pattern can have a toxic influence on their health, contributing to hypertension or CVD. In individualist Western countries, the responsibility to deal with problems in uncontrolled situations, such as excessive burden of job or sudden life events falls on the individual. For this reason, type A individuals are forced to make excessive effort, which can contribute to intense emotional responses in uncontrolled situations. As a result, type A individuals tend to be at an increased risk for hypertension and CVD in Western countries. However, in the Japanese cultural context, the ideas or responsibility of the social group are given priority over the ideas or responsibility of the individual. Furthermore, members of the same social group complement each other to help maintain the social group. These collectivistic behaviors might not oblige type A individuals to make excessive efforts. Thus, Japanese collectivistic culture may protect type A individuals from the toxic aspects of type A behavior pattern.

Second, the non-type A individuals may hesitate to express emotions, such as anger and suppress their emotions, which could result in elevated blood pressure. Anger suppression may lead to high blood pressure (27). In traditional Japanese culture, it is important to match other people by suppressing one's own feelings or ideas, which continues to exist. The word "KY" is a common term currently used in Japan. "KY" refers to an individual's inability to understand the group atmosphere. In this cultural context, those with non-type A behavior pattern adapt excessively to other people and the atmosphere, and they may be unable to express their own emotions, contributing to increased blood pressure.

There are several limitations to this study. First, this study used a cross-sectional design; therefore, any conclusion regarding the causal relationships between factors cannot be drawn. Second, blood pressure data were obtained using self-report in this study, which could result in the blood pressure data being inaccurate and biased. However, the distribution of blood pressure in this study was nearly the same as a nationwide survey (the National Health and Nutrition Survey).

Conclusion

There might be negative association between type A behavior pattern and systolic blood pressure in the current cultural context of Japan. This result is contrary to the result of previous research in conducted in Western counties.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interest.

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