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CORRESPONDENCE

Response to Yatabe *et al.*

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We thank Dr Yatabe *et al.*[1] for their interest in our subanalysis of the Hypertension Objective Treatment based on Measurement by Electrical Devices of Blood Pressure (HOMED-BP) study regarding seasonal variations in home blood pressure.[2] As they indicated,[1] the lack of data on room temperature, which would affect home blood pressure on each occasion, was a limitation of the HOMED-BP study. Because the addresses of study patients were not collected, we instead used regional information from study centers for the analysis of summer–winter differences in the home blood pressure, that is, northern or southern part of Japan.[2] The incorporation of an automated thermometer (a temperature data logger) into the blood pressure measurement device[1] seems be an innovative approach for home monitoring, as few studies investigating seasonal variation have focused on room temperature.[3] However, some studies have evaluated the association between outdoor temperature and blood pressure,[4,5] and our report[2] regarding overall trends in seasonal variations in blood pressure supports their findings that the outdoor temperature is highly correlated with the blood pressure in a population.[4,5] Surprisingly, just as in HOMED-BP, a slight shift in the timing of seasonal variations in blood pressure to a few weeks earlier than the nadir and peak of outdoor temperature was also observed among the participants in Aizumisato town in which the room temperature instead of the outdoor temperature was assessed.[1]

Per the request of Yatabe *et al.*,[1] we evaluated the correlations between the maximum–minimum difference (MMD) and coefficient of variation (CV) of self-measured home blood pressure among the 1649 eligible HOMED-BP patients analyzed in our previous report.[2] We used the home blood pressure captured throughout the second year after randomization in HOMED-BP and estimated the average level, MMD and CV of home blood pressure within a full year as well as within each month. The ranges of blood pressure within a given month, as represented by MMD and CV, were smaller than in a full year (Table 1). Pearson's correlation coefficients between MMD and CV throughout a full year were 0.86 and 0.81 for systolic and diastolic home blood pressure, respectively ($P<0.0001$; Figure 1). Significant correlations were also observed in each month (Table 1); MMD, therefore, seems to be a simple and useful indicator for the entire home blood pressure variability, as represented by CV. However, it

Table 1 Correlation between MMD and CV among 1649 patients

		Systolic blood pressure				*Diastolic blood pressure*			
Periods	n	*Mean*	*MMD*	*CV*	r	*Mean*	*MMD*	*CV*	r
Full year	1647	129.7±8.2	61.1±15.6	8.2±1.9	0.86	76.9±6.9	35.6±9.3	7.8±1.9	0.81
Each month									
January	1632	132.7±10.1	37.8±12.5	7.2±2.1	0.87	78.0±7.7	21.5±7.6	6.9±2.2	0.86
February	1618	131.9±10.3	36.8±12.3	7.2±2.2	0.87	77.7±7.6	21.0±7.7	6.9±2.3	0.86
March	1620	131.3±10.0	37.6±13.1	7.2±2.2	0.88	77.4±7.6	21.4±7.9	6.8±2.2	0.86
April	1626	130.1±9.7	36.2±12.2	7.0±2.0	0.87	77.0±7.5	20.7±7.3	6.8±2.2	0.84
May	1628	128.7±9.3	36.6±11.9	7.1±2.1	0.87	76.4±7.4	21.0±7.2	6.9±2.1	0.85
June	1631	126.8±9.1	35.3±11.5	7.0±2.1	0.88	75.5±7.4	20.5±7.3	6.7±2.2	0.87
July	1635	125.9±9.2	35.3±11.5	7.0±2.1	0.88	75.1±7.5	20.4±6.8	6.7±2.0	0.85
August	1627	126.2±9.4	35.8±11.4	7.1±2.1	0.89	75.3±7.5	20.5±7.2	6.7±2.1	0.86
September	1629	127.9±9.2	35.9±11.8	7.1±2.1	0.88	76.4±7.3	20.5±6.9	6.7±2.0	0.85
October	1622	130.9±9.4	37.4±12.0	7.2±2.0	0.87	77.8±7.4	21.0±7.0	6.7±2.0	0.85
November	1627	131.8±9.7	37.4±12.6	7.2±2.2	0.87	77.9±7.4	21.0±7.6	6.8±2.2	0.88
December	1628	132.6±9.8	38.4±12.7	7.3±2.1	0.86	78.1±7.7	21.6±7.7	6.9±2.2	0.85

Abbreviations: BP, blood pressure; CV, coefficient of variation; HOMED-BP, Hypertension Objective Treatment based on Measurement by Electrical Devices of Blood Pressure; MMD, maximum–minimum difference.
The values are expressed as the mean±s.d. *r* denotes the correlation between MMD and CV in a full year and in each month separately. Home BP data in individuals captured in the second year after randomization in the HOMED-BP study were used; therefore, BP data on 2–31 patients were lacking depending on the evaluation period.

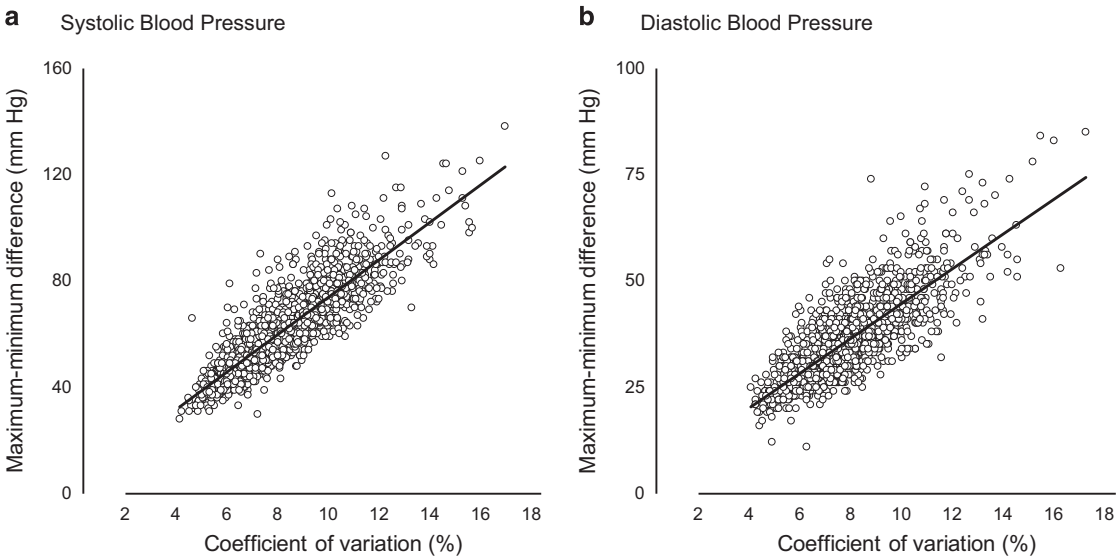

Figure 1 Associations between the maximum–minimum difference and coefficient of variation in (**a**) systolic and (**b**) diastolic home blood pressure throughout the second year from randomization in the HOMED-BP study. Significant correlations were observed in both the systolic ($r=0.86$; $P<0.0001$) and diastolic ($r=0.81$; $P<0.0001$) home blood pressure. HOMED-BP, Hypertension Objective Treatment based on Measurement by Electrical Devices of Blood Pressure.

should be noted that neither CV nor MMD can be treated as an alternative index of seasonal variations in blood pressure, which increases in winter, decreases in summer and periodically fluctuates within a single-year cycle.

In addition to meteorological effects, such as temperature and daylight hours, blood pressure variation can be affected by a number of factors including physical activity,[6] psychological stress[6] and medications.[2] Epinephrine,[7] aldosterone[7] and normetanephrine[8] levels also fluctuate within a single-year cycle in individuals, which may mediate the seasonality of blood pressure. A comprehensive analysis considering such factors is therefore needed in order to explore the mechanism and clinical usefulness of seasonal variations in blood pressure.

CONFLICT OF INTEREST

TH is a full-time employee of GlaxoSmithKline, but has contributed to this study independently of GlaxoSmithKline. Omron Healthcare provided research support to YI and TO. KA declares no conflicts of interest

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