

Original**Habitual Green Tea Consumption May Lower Systolic Blood Pressure**Shin Yamaoka^{1*}¹ Department of Food and Nutrition, Junior College Division, University of Aizu, Fukushima Japan

ABSTRACT *Background and purpose.* Green tea is believed to have beneficial effects on hypertension. However, data from intervention studies regarding the physiological effects of green tea are limited, and to clarify its effects, additional data from intervention studies are necessary to gain insights into alleviating human hypertension. Therefore, this study aimed to investigate the effects of regular green tea consumption on blood pressure in humans. *Methods.* This study included five male and female junior college students who reported no health issues. Green tea (Sencha) was purchased from a Japanese manufacturer. Green tea was distributed in teabags, and participants were asked to drink one cup of green tea daily for 2 weeks, with one teabag per cup. Blood pressure was measured at three time points: before drinking green tea (noon) and 1 and 2 weeks after starting tea consumption (noon). Blood pressure was measured twice at each time point using an upper-arm blood pressure monitor, and the average of the two measurements was recorded as the final values for systolic (SBP) and diastolic (DBP) blood pressure. *Results.* Comparison of the blood pressure measured before starting green tea consumption with that measured 1 and 2 weeks after starting green tea consumption revealed that consumption of one teabag of Sencha in a cup per day significantly decreased SBP. However, no significant difference in DBP was found when comparing the measurements taken before starting drink green tea consumption with those taken 1 and 2 weeks after. *Conclusion.* This study suggests that consuming one cup of green tea made with one teabag per day for more than 1 week may lead to a reduction in SBP.

Keywords: Green Tea, Blood Pressure, Systolic Blood Pressure

INTRODUCTION

The Guidelines for the Management of Hypertension 2019 (The Japanese Society of Hypertension) estimated that the number of patients with hypertension in Japan is approximately 43 million (1). Hypertension is considered a risk factor for the onset and progression of cardiovascular and cerebrovascular diseases (2,3). Excessive salt intake and obesity may contribute to the development of hypertension (3,4).

Green tea consumption is believed to have a beneficial effect on hypertension (5). The mechanisms by which it lowers blood pressure are thought to involve reduction of oxidative stress, improvement of endothelial function in the aorta *in vivo*, alleviation of inflammation, and improvement of endothelial function in aortic endothelial cells *in vitro*. Additionally, tea may help suppress contraction responses, improve vasodilation in the aortic tissue *in vitro*, inhibit renal sympathetic nervous system activity, and improve arterial baroreceptor function (5). However, interventional studies on the

physiological effects of green tea in humans are few, and to clarify these effects, additional data from intervention studies are needed (6). Therefore, this study aimed to investigate the effects of habitual green tea consumption on blood pressure in humans.

MATERIALS AND METHODS**Research Ethics and Participants**

This study included five male and female junior college students (aged 18 to 20 years; male n=1 and female n=4) who self-reported no health issues. This study was approved by the Ethics Committee of University of Aizu (approval number: 2024 University of Aizu No. 90). The purpose of the study was thoroughly explained to the participants, and written informed consent was obtained from all participants.

Research Design

This study used green tea from a Japanese manufacturer (Sencha; the manufacturer's name is omitted because of commercial considerations). Green tea was distributed in teabags, and

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participants were instructed to place one teabag in a cup of water and drink the infusion once a day for 2 weeks, at any time of the day. Blood pressure was measured twice at three time points: before starting green tea consumption during the daytime (11:50–12:20) and 1 and 2 weeks after starting green tea consumption during the daytime (11:50–12:20). Blood

pressure (systolic [SBP] and diastolic [DBP] blood pressure) was measured using an Omron Upper Arm Blood Pressure Monitor Standard 19 Series HCR-7104 (OMRON Corporation, Kyoto, Japan), and the average of the two measurements was used as the recorded value (Fig 1. Experimental Design).

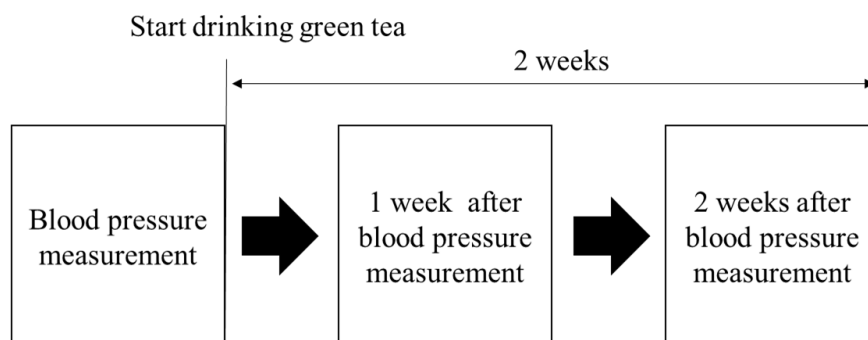


Fig 1. Experimental Design

Statistical analyses

Data are expressed as the mean \pm standard error of the mean (SEM). Statistical analyses were performed using the Student's t-test to compare the means between each group (Excel statistical software: Social Survey Research Information Co., Ltd.). Statistical significance was set at $p < 0.05$.

RESULTS

The addition of one bag of roasted green tea to a cup of water significantly decreased SBP 1 and 2 weeks after starting consumption (Fig 2). However, no significant differences were observed in DBP when comparing the measurements taken before starting green tea consumption with those taken 1 and 2 weeks later.

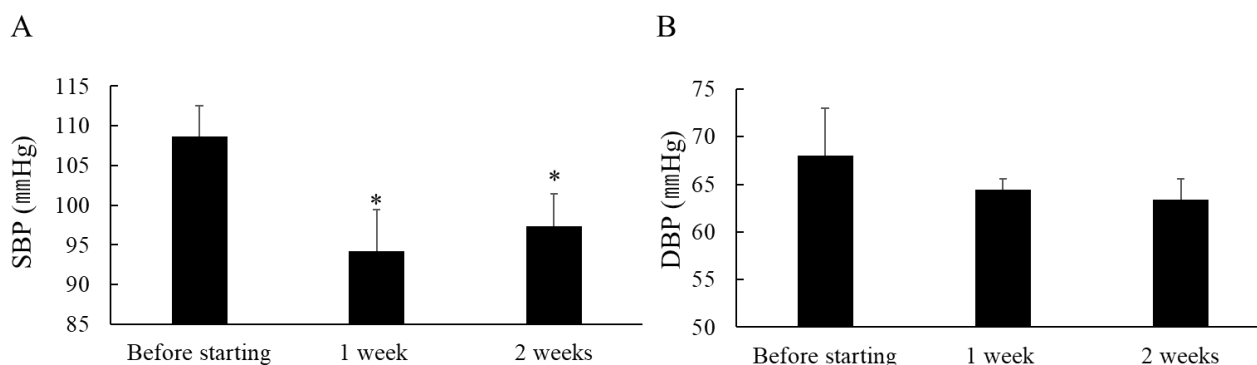


Fig 2. (A, B). Effect of green tea on SBP (A) and DBP (B). Values are presented as mean \pm SEM.

* $p < 0.05$ compared to the before starting.

DISCUSSION

The addition of one bag of roasted green tea to a cup of water significantly lowered SBP starting 1 week after consumption. However, no changes were observed in diastolic blood pressure even after drinking a cup of roasted green tea with one teabag.

To illustrate/demonstrate the reduction in blood pressure via green tea consumption, an

experiment reported that in a sodium chloride-induced hypertensive rat model, the intake of green tea extract for 6 weeks resulted in a decrease in both SBP and DBP (7). In a study conducted in China involving humans, individuals who habitually consumed green tea had significantly lower SBP than those who did not drink tea (8). Therefore, similar to the findings of previous studies, green tea consumption resulted in a

decrease in SBP, suggesting that making green tea consumption a habit may be effective in improving blood pressure (9,10).

Green tea infusion contains a large amount of polyphenols, such as catechins. Studies investigating the mechanism by which catechins lower blood pressure have revealed that they may contribute to the improvement of oxidative stress, positive regulation of angiogenesis, endothelial cell proliferation, and the signalling pathway of vascular endothelial growth factor receptors (10). In humans, the intake of epigallocatechin gallate capsules for 8 weeks in obese individuals resulted in a decrease in both SBP and DBP (11). In contrast, tea contains catechins, theanines, and amino acids (9). Administration of theanine to spontaneously hypertensive rats through drinking water resulted in a decrease in SBP (12). Therefore, the decrease in DBP after tea consumption may be attributed to the effects of the compounds present in green tea, such as catechins and theanine.

Improvements in lifestyle habits, such as regular exercise and salt intake reduction, can help improve alleviate hypertension (13,14). Therefore, a limitation of this study is that since exercise and dietary intake were not monitored during the experimental period, whether the decrease in SBP was solely due to green tea consumption remains unclear. Another limitation was that tea consumption was instructed as one teabag per cup; therefore, the exact amount of water and temperature used were unclear. As the amount of catechins in the infusion can vary depending on the green tea brewing method, each individual may consume different amounts of green tea components (15). Taken together, these factors indicate that this study only suggests a decrease in SBP from drinking one cup of green tea made with one teabag per day and does not provide definitive evidence. Future studies should clarify the tea brewing method, quantity, and lifestyle habits to better clarify the specific mechanisms by which green tea consumption leads to a reduction in blood pressure. Furthermore, this study had a small sample size of five participants, who were all young adults aged 18–20 years. Therefore, further research using a larger sample size across different age groups is warranted to investigate the impact of green tea consumption on blood pressure among a broader range of participants.

This study suggests that consuming one cup of green tea made with one teabag per day for more than 1 week leads to a reduction in SBP. Conducting more interventional studies on green tea consumption is essential to alleviate hypertension through nonpharmacological therapies.

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