



# The Effect of Wet Cupping on Baroreceptor Sensitivity in Hypertensive Patients in Sidenreng Rappang Regency, South Sulawesi

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## Abstract

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**BACKGROUND:** Wet cupping therapy removes toxins, thereby increasing blood flow and stimulating baroreceptors sensitivity which provides a stimulus to the autonomic nerves. This stimulus reduces the sympathetic nerves' work and inhibits the vasomotor center, and leading to vasodilation, thereby decreasing blood pressure and pulse frequency.

**AIM:** This research aims to determine the effect of wet cupping therapy on baroreceptors sensitivity with blood pressure and pulse frequency indicators.

**METHODS:** It was conducted in Sidenreng Rappang Regency, South Sulawesi, Eastern Indonesia from February to May 2021. Randomized Controlled Trial method was used including two groups of 31 respondents each. The intervention group used wet cupping therapy to regulate anti-hypertensive drugs and the control group used anti-hypertensive drugs with blood pressure and pulse frequency measurements until 6 weeks after the therapy. The measurement of arterial baroreflex sensitivity, such as the magnitude of the change in the RR interval and changes in the systolic blood pressure is expressed in milli-seconds/mmHg units. Wet cupping affects baroreceptor sensitivity by reducing the indicators.

**RESULTS:** The result showed a significant difference in blood pressure measurement (systolic and diastolic) before and after the 2-week follow-up period ( $p = 0.000$ ;  $p = 0.001$ ), and between 2 and 4 weeks ( $p = 0.000$ ;  $p = 0.000$ ), but between 4 and 6 weeks there was no significant difference in the intervention group ( $p = 0.248$ ;  $p = 0.583$ ). There was a significant difference in pulse frequency at 2 and 4 weeks after the intervention ( $p = 0.016$ ). Furthermore, a difference was also observed in arterial baroreflex sensitivity values in the RR interval parameters before and after cupping therapy ( $p = 0.000$ ).

**CONCLUSION:** In conclusion, wet cupping therapy effectively increases baroreceptor sensitivity by reducing blood pressure and pulse frequency indicators in hypertensive patients up to 4 weeks limit after the therapy, without any serious side effects experienced by respondents.

## Introduction

Hypertension increases the prevalence of cardiovascular diseases [1]. Indonesia is one of the countries containing the most hypertensive patients [2] with a prevalence of 24.4% in 2008, 25.8% in 2013 and increasing in 2018 by 34.1% [3]. Therefore, it is potentially higher than the available data. Patients with hypertension can attenuate baroreceptor stimuli [4], an autoregulatory system regulating heart rate and blood pressure located in the carotid sinuses of the aorta which stimulates efferent autonomic nerve activity to the heart and other blood vessels [5].

Increased baroreceptor sensitivity increases sympathetic and parasympathetic activity, and it results in a decrease of heart rate and blood pressure. Meanwhile, decreased baroreceptor sensitivity will cause an increase in blood pressure [6]. This sensitivity

may influence the increasing prevalence of hypertension and cardiovascular diseases [7]. Therefore, a non-pharmacological action or therapy is needed to lower blood pressure in hypertensive patients.

One of complementary therapy is using the wet cupping method, a traditional treatment [8]. Research from Saudi Arabia stated that wet cupping therapy reduces systolic blood pressure effectively in hypertensive patients for about 4 weeks, without any serious side effect [9]. Another previous research stated that the location of the cupping point in the treatment of hypertension only focuses on two points [10]. In addition, some previous research results show that no one discussed specifically the increase in baroreceptor sensitivity by looking at indicators of blood pressure and heart rate.

Other researches stated there are six theoretical effects produced by cupping therapy. The reduction in pain levels is explained by "Pain-Gate

Theory,” “Diffuse Noxious Inhibitory Controls,” and “Reflex zone theory.” Furthermore, muscles relaxation, changes in local tissue structure, and increased blood circulation is explained by the “Nitric Oxide theory.” The immunological effect is explained by “Activation of the immune system theory.” Toxins release, waste, and heavy metals removal are described by “Blood Detoxification Theory” [11]. None of these theories has discussed the problem of increasing baroreceptor sensitivity. Therefore, this research aims to determine the effect of wet cupping therapy on increasing baroreceptors sensitivity in hypertensive patients.

## Methods

This research was conducted in Sidenreng Rappang Regency, South Sulawesi, Eastern Indonesia from February to May 2021 and a Randomized Controlled Trial design. Before data collection, an approval was obtained from the Research Ethics Commission of STIKES Muhammadiyah Sidrap (No.426/KEP/II.3.AU/F/2021), using ethical principles by requesting prior informed consent from respondents. Two groups were involved, namely, the intervention group that received wet cupping therapy in addition to anti-hypertensive drugs, and the control which only received anti-hypertensive drugs.

The respondents were those who suffering from Grades I and II hypertension. The sample met the criteria when they had high blood pressure (systolic and diastolic blood pressure  $\geq 140$  mmHg and  $\geq 90$  mmHg, respectively), ages between 25 and 50 years, and were male. Those having Grade III hypertension (systolic and diastolic blood pressure of 180 mmHg and 110 or more), a complicating disease such as DM, and an additional hypertension risk according to hypertension management guidelines (WHO) were excluded from the study.

Wet cupping therapy procedure, namely, measures blood pressure, prepare wet cupping equipment (handsoon, mask, apron, cuppings, cupping pump, lancing, lancet, tray, com, sterile gauze, scissors, and herbal oil), clean the area using herbal oil and put a header then suction for 3–5 min, do a lancing device injury then put the header back on and suction. After 3–5 min open header, wipe around clamped area Wet cupping therapy is carried out at three points on the body. The first point is located 2 fingers posterior to the corners of the lower jaw on either side, just below the skull bone at the hairline (*Al-Akhda'ain*). The second point is the upper part of the spine that extends to the neck, at the sixth vertebrae or C7 cervical spine (*Al-Kaahil*). Another point is on both sides of the shoulder blade (*Azh-Zahrul A'la*). In this research, wet cupping therapy was carried out once a month for 3

consecutive months on the 17<sup>th</sup>, 19<sup>th</sup>, and 21<sup>st</sup> of the Arabic calendar (*Hijri*).

The results were blood pressure, pulse measurements and the measurement of arterial baroreflex sensitivity, which is the magnitude of the change in the RR interval when the systolic blood pressure changes. Each measurement was taken in a seated position using a digital oscillometric sphygmomanometer and watched in seconds to minimize biased results. Measurement of blood pressure and pulse was carried out after the wet cupping therapy, then screening every week to determine the average value of the decrease in blood pressure and pulse rate to determine the maximum daily limit for the effect of cupping therapy on blood pressure. Based on the guidelines, patients were advised to rest 3–5 min after receiving wet cupping therapy and then carry out blood pressure and pulse measurements in the arm during the initial visit. They were also advised not to consume foods containing nicotine or caffeine for 1 h before measuring blood pressure. Measurement results were recorded to be documented at least twice per visit. In addition, visits schedule was once a week for the next 8 weeks.

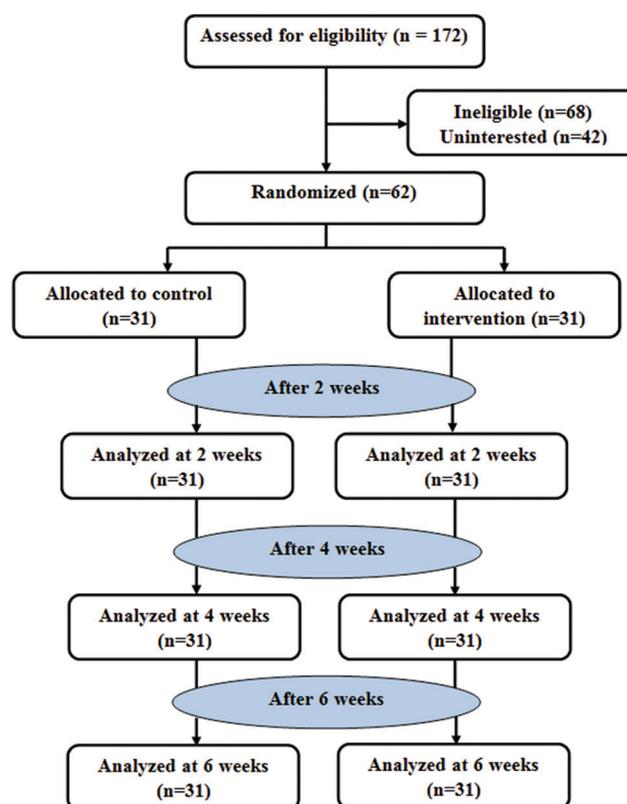


Figure 1: Flowchart of research sample recruitment

The wet cupping therapy has potential side effects according to the previous researches, which was evaluated at 2 and 4 weeks after the procedure. An electrocardiogram (ECG) was used to record 30 beats at a speed of 50 mm/s before and after cupping therapy (2<sup>nd</sup>, 4<sup>th</sup>, and 6<sup>th</sup> weeks) to measure the sensitivity of the arterial baroreflex. Meanwhile, all actions were recorded

on the computer and ECG paper, and the RR interval distance was calculated using a Mitutuyo micrometer. The value was obtained after conducting a comparison of the RR interval with systolic blood pressure from an interval of 20 beats, until there was a decrease in the lowest systolic blood pressure after cupping therapy.

Hypertensive patient's number as a population was 172 respondents subjected to the feasibility test. This was filtered based on the research criteria, 68 people were excluded, and 42 refused to participate. Therefore, the remaining 62 were sampled and randomized into intervention and control groups of 31 people each. All the respondents engaged in every follow-up stage after wet cupping therapy for 2, 4, and 6 weeks in both groups (Figure 1).

Statistical analysis was performed using the SPSS version 21.0 program. Blood pressure comparisons were carried out in both groups from the commencement of measurement, to 2 and 4 weeks after the intervention using the paired t-test. A second blood pressure comparison was also performed with  $p < 0.05$  which was considered significant and the differences in mean blood pressure had a confidence interval of 95%.

Based on the comparison between the control and intervention groups, there was no difference in the respondents' characteristics with  $p < 0.05$ . Furthermore, the mean age was between 43 and 39 years or middle age group and had a hereditary history of heart disease. The LDL value showed that the average cholesterol was moderate, and physical activity was also lacking. Therefore, this result has a homogeneity value between both groups (Table 1).

**Table 1: Comparison of characteristics in each group (n = 62)**

Characteristics	Control group	Intervention group	p*
Mean age, years ( $\pm$ SD)	43.0 $\pm$ 6.8	39.3 $\pm$ 9.1	0.146
Mean Length of suffering from hypertension, ratio ( $\pm$ SD)	6.9 $\pm$ 1.8	6.6 $\pm$ 1.6	0.559
Mean low-density lipoprotein, mg/dL ( $\pm$ SD)	152.3 $\pm$ 14.2	158.7 $\pm$ 16.4	0.241
Family history of heart disease, n (%)	24 (38.7)	29 (46.8)	0.152
History of smoking, n (%)	17 (27.4)	18 (29.1)	0.437
Physical activity, n (%)	15 (24.2)	13 (21.0)	0.214

SD: Standard deviation, LDL: Low density lipoprotein.

## Results

Respondents in the intervention group after receiving the wet cupping therapy did not have serious side effects. Most of them had mild side effects only after a few hours, namely cupping location pain which did not exceed 48 h. Furthermore, at 2 weeks, little number of respondents felt dizzy, headache, weakness, and drowsiness. At 6 weeks after therapy, some still experienced headaches and dizziness due to their lifestyle, physical activity, and smoking history which they did not control. The side effects for scar infection were not visible during the 2–6 weeks follow-up process (Table 2).

**Table 2: Frequency of side effects incidence from wet cupping therapy during the period (n = 62)**

Side effects	After the wet cupping treatment			Total frequency	Percentage
	2 weeks	4 weeks	6 weeks		
Cupping location pain	3	0	0	3	9.5
Weak and sleepy	6	1	0	7	21.4
Headache	1	0	7	8	38.1
Suction cup-head	21	0	0	21	76.2
Dizzy	3	0	5	8	38.1

Baroreceptor sensitivity in hypertensive respondents has a visible difference from lowering blood pressure's mean value. Based on the BP systolic indicator before and after a follow-up of 2–4 weeks, there was a significant difference in the elderly based on paired t-test ( $p = 0.000$ ). This result is different from the measurement after 4 and 6 weeks which indicated no significant difference in systolic BP ( $p = 0.248$ ) (Table 3). Consequently, the systolic BP at week 4 was within normal limits at week 6. However, a mean increase of 1.62 mmHg was discovered in the 6-week follow-up period, therefore, the effect limit of wet cupping therapy was only up to week 4 (Table 3).

**Table 3: Comparison of baroreceptor sensitivity to blood pressure indicators after 2–6 weeks of wet cupping therapy**

Difference in measurement results (n=31)	Mean difference $\pm$ SD	Min-Max (CI95%)	t	p*
TD Systole (mmHg)				
Before therapy $\rightarrow$ after 2 weeks	22.17 $\pm$ 7.01	18.52–25.84	14.72	<0.001
After 2 weeks $\rightarrow$ after 4 weeks	10.82 $\pm$ 6.18	8.0–12.65	7.59	<0.001
After 4 weeks $\rightarrow$ after 6 weeks	-1.62 $\pm$ 5.81	-4.36–2.03	-1.34	0.248
TD Diastolic (mmHg)				
Before therapy $\rightarrow$ after 2 weeks	6.32 $\pm$ 6.56	3.05–8.03	4.01	0.001
After 2 weeks $\rightarrow$ after 4 weeks	9.27 $\pm$ 7.14	6.38–10.24	6.54	<0.001
After 4 weeks $\rightarrow$ after 6 weeks	-0.37 $\pm$ 6.38	-3.65–3.08	-2.74	0.583

\*p < 0.05; BP: Blood pressure; SD: Standard deviation; CI: 95% of confidence interval; and t: student's t-test.

Differences in the baroreceptor sensitivity on diastolic blood pressure indicators were also significantly different (paired-t-test). Based on the results of diastolic BP between before and after 2 weeks of wet cupping therapy, there was a significant difference ( $p = 0.000$ ). This was applied to the values of diastolic BP measurement 2 and 4 weeks after the therapy, which had a significant difference ( $p = 0.000$ ). The results differed from the 4 and 6 weeks of follow-up period, which showed no significant difference ( $p = 0.583$ ). This is because the mean diastolic BP values at week 4 and 6 were already within normal limits, but there was an average increase of 0.37 mmHg at week 6. Therefore, the limit for the effect of wet cupping therapy in increasing baroreceptors sensitivity to blood pressure indicators was found at 4 weeks after therapy in both systolic and diastolic BP (Table 3).

Table 4 shows that there is a significant difference in the baroreceptor sensitivity to the pulse frequency indicator (paired-t-test). Based on the pulse frequency results, there was a significant difference between before and after 2 weeks of wet cupping therapy ( $p = 0.009$ ). The values of diastolic BP measurement at 2 weeks and 4 weeks after therapy had a significant difference ( $p = 0.016$ ). Furthermore, the 4 and 6 weeks of follow-up period had a significant difference ( $p = 0.030$ ). This was because the pulse frequency mean value from week 2 to 6 lies within

**Table 4: Comparison of the sensitivity of the baroreceptors to pulse rate indicators after 2–6 weeks of wet cupping therapy**

Difference in measurement results (n = 31)	Mean difference ± SD	Min-Max (CI95%)	t	p*
Pulse rate (times/minute)				
Before therapy → after 2 weeks	2.27 ± 3.71	0.63–3.92	2.88	0.009
After 2 weeks → after 4 weeks	2.0 ± 3.57	0.42–3.58	7.59	0.016
After 4 weeks → after 6 weeks	1.96 ± 3.95	0.21–3.70	2.32	0.030

\*p < 0.05; BP: Blood pressure; SD: Standard deviation; CI: 95% of confidence interval; t: student's t-test.

normal limits, but there was an average decrease of 1.96 beats/min at week 6. Therefore, the wet cupping therapy effect's limit in increasing baroreceptors sensitivity to pulse frequency indicators occurred until the 6-week after the therapy.

The mean value of baroreceptor sensitivity in the group before wet cupping therapy was conducted after 2 weeks. Table 5 showed the difference in the value of the RR interval parameter, which is  $1.65 \pm 1.54$  ms/mmHg ( $p \leq 0.001$ ). The measurement group after 2 and 4 weeks showed an RR interval value of  $0.34 \pm 1.79$  ms/mmHg ( $p = 0.356$ ). Therefore, wet cupping has an effect on increasing baroreceptor sensitivity with a value of the parameter interval RR increased by 0.34 ms/mmHg. The group after 4 and 6 weeks had a significant difference ( $p \leq 0.001$ ), this indicates that the cupping effect has disappeared due to a decrease in baroreceptor sensitivity with an RR interval parameter value of 1.59 ms/mmHg. Therefore, the wet cupping on increasing arterial baroreflex had an effect which was very high at week 4. This was conducted after therapy with an average RR interval of 8.26 ms/mmHg (Normal 8 ms/mmHg).

**Table 5: Comparison of baroreceptor sensitivity parameter values before and after wet cupping therapy through ECG recordings at RR intervals (ms/mmHg)**

Differences in measurement results (n=31)	Mean difference ± SD	Min-Max (CI95%)	t	p*
Interval RR ms/mmHg				
Before therapy → after 2 weeks	1.65 ± 1.54	1.08–2.01	5.38	<0.001
After 2 weeks → after 4 weeks	0.34 ± 1.79	0.34–0.98	1.00	0.356
After 4 weeks → after 6 weeks	1.59 ± 2.03	0.80–2.29	4.25	<0.001

\*p < 0.05; SD: Standard deviation; CI: 95% of confidence interval; t: student's t-test.

## Discussion

The research showed a significant difference between the intervention and control groups baroreceptors sensitivity detected through a decrease in systolic bp of 10.02 mmHg, diastolic bp of 9.27 mmHg, and pulse frequency of 2.27 beats/min after 2 weeks of follow-up. After 6 weeks of follow-up, the wet cupping effect stopped and there was no significant difference in blood pressure in both groups. Meanwhile, there was a difference in pulse frequency from week 2 to 6. These results are consistent with previous research that found a significant difference in systolic blood pressure values between the intervention and control groups after 2 weeks of follow-up [12]. Another Chinese

research stated wet cupping lowers blood pressure at the 4<sup>th</sup> week after therapy [13]. Therefore, it produces an effect lasting for 2–4 weeks but not applied to the pulse frequency.

In comparison, the results of blood pressure before wet cupping therapy were performed at a follow-up period of 2 and 6 weeks. There were significant differences in the intervention as well as in the control groups. However, the decrease in blood pressure was not very significant probably because the follow-up period was too short. The respondents are aware of their blood pressure results and therefore change their diet and daily lifestyle such as physical activity, as well as adhere to a low salt diet. Physical conditions greatly affect the increase in baroreceptors' sensitivity as an autoregulation to blood pressure or heart health [14]. Furthermore, the respondents showed 27.4% in the control group and 29.1% in the intervention group had a history of smoking and lack of physical activity.

An Arabian research carried out using the wet cupping therapy method and comparing blood pressure results before and after 2 months of the procedure showed a significant difference [15]. These differ from the current result which showed the initial period with the follow-up period after wet cupping therapy had an increased baroreceptors sensitivity at week 2 and blood pressure at week 4 was within normal limits. The week 6 had an increase of 1.62 mmHg in systolic BP and 0.37 mmHg in diastolic BP from normal limits at week 4. Meanwhile, there is a difference in pulse frequency from week 2 to 6. The wet cupping is used as an alternative therapy with a time limit effect of 4 weeks in maintaining the baroreceptors' sensitivity as blood pressure and pulse frequency regulators in hypertensive patients.

This research showed the average value of baroreceptor sensitivity in the group before wet cupping therapy after 2 weeks. Table 5 showed the difference in the RR interval parameter value, which is  $1.65 \pm 1.54$  ms/mmHg ( $p \leq 0.001$ ). The differences in the measurement group after 2 and 4 weeks showed an RR interval value of  $0.34 \pm 1.79$  ms/mmHg ( $p = 0.356$ ). This indicates that the effect of wet cupping has an effect on increasing baroreceptor sensitivity with an increased value of 0.34 ms/mmHg. Meanwhile, the group after 4 and 6 weeks had a significant difference ( $p \leq 0.001$ ), which showed that the cupping effect had disappeared due to a decrease in baroreceptor sensitivity with an R-R interval parameter value of 1.59 ms/mmHg. Therefore, the wet cupping on increasing arterial baroreflex was very high at week 4 after therapy with an average RR interval of 8.26 ms/mmHg (Normal 8 ms/mmHg).

An ECG was used to record 30 beats at a speed of 50 mm/second to measure the sensitivity of the arterial baroreflex 1 week after cupping therapy. In addition, all the actions were recorded on the computer and ECG paper, also the RR interval distance was calculated using a Mitutuyo micrometer. The value

was obtained after conducting a comparison of RR interval with systolic blood pressure from 20 beats. This was carried out to obtain the lowest decrease in systolic blood pressure after cupping therapy [16]. The same procedure was conducted in the previous research, and the mean arterial baroreflex sensitivity of pre-PTCA and post-PTCA was  $2.51 \pm 3.23$  ms/mmHg and  $1.96 \pm 1.61$  ms/mmHg. Statistically, the difference in this value was significant after nitrate drugs were administered ( $p = 0.035$ ) [17].

The process of wet cupping therapy is carried out on every 17<sup>th</sup>, 19<sup>th</sup>, and 21<sup>st</sup> (*hijria*) selected based on Islamic literature [18]. Another research stated it is not carried out on any other days, other than the one recommended by Islamic literature once a month for 3 consecutive months [19]. Therefore, further research is needed to focus on the differences between certain days and other days of wet cupping therapy results for changes in blood pressure and Mean Arterial Pressure (MAP) in hypertensive patients.

Although wet cupping therapy affects the increase in baroreceptor sensitivity by reducing blood pressure and pulse rate indicators. This decrease is influenced by several factors, one of which is the amount of blood removed during suction [11]. However, the amount of blood removed was not measured, hence, the greater the blood clots number, the better the result [20]. The mechanism of wet cupping therapy removes toxins mixed with blood or oxidants from the body through the skin surface [21]. This increases blood flow and prevents atherosclerosis, thereby stimulating the baroreceptors sensitivity which provides a stimulus to the autonomic nerves (reduce the sympathetic nerves work). Therefore, inhibiting the vasomotor center which causes vasodilation, leading to decreased blood pressure and pulse frequency [22].

The mechanism of increasing baroreceptors sensitivity with decreasing blood pressure and pulse frequency through the effect of wet cupping therapy is explained in the "Taibah Theory." This theory states wet cupping therapy dries out intestinal and excess intravascular fluid, as well as harmful metallic substances [23]. Wet cupping also stimulates endogenous nitric oxide production and excretion of accumulated vasoactive substances and free radicals, which leads to reduced blood pressure measurements [24]. Therefore, this therapy is useful for preventing a decrease in baroreceptors sensitivity which stimulates blood pressure and pulse frequency increase.

In this research, wet cupping therapy is believed to be a safe and harmless action because it does not have serious side effects for hypertensive patients. The immediate side effects were only minor pain due to the use of the lancing device and pulling the header, but this did not last long and disappeared after 1–2 days. Another effect is, there is a scar that disappears over time, which is within 5–7 days. Dizziness, headache,

and weakness were experienced by some respondents but these did not make them withdraw from participating because there were more positive effects they felt after the wet cupping therapy. The previous research stated that the side effects of wet cupping therapy are divided into local and systemic side effects [25].

This research has a good effect, one of which is controlling the respondent's condition after cupping therapy for up to 6 weeks of the follow-up period. The limitation found showed that it did not measure the number of blood clots per cupping cup at the points of *Al-Akhda'ain*, *Al-Kaahil*, and *Azh-Zahrul A'la*. This is different from previous research because it focuses on determining the sensitivity of the baroreceptor functioning as a regulating system for blood pressure and pulse frequency using the *taibah* theory approach. Therefore, these results are very useful for medical personnel in providing interventions related to the handling and prevention of increased blood pressure in hypertensive patients with wet cupping therapy which has an effect up to 4 week and provides a stimulus to increase baroreceptors in the carotid sinuses.

## Conclusion

Wet cupping therapy effectively increases baroreceptors sensitivity which extends the RR interval, reduces blood pressure, and pulse frequency in hypertensive patients up to a limit of 4 weeks, without any serious side effects. Therefore, it deserves to be recommended as a therapy for the prevention of hypertension. Further research needs to pay attention to the number of blood clots per cupping cup and not use anti-hypertensive drugs simultaneously. Research development on the measurement of MAP is also recommended.

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