

Cooling the heat of temptation: Mental self-control and the automatic evaluation of tempting stimuli

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Abstract

The present research investigated whether mental self-control strategies can reduce the automatic positivity elicited by tempting stimuli. In two studies employing chocolate as the temptation of interest, we found that participants instructed to imagine a chocolate product in a nonconsummatory manner exhibited significantly less automatic positivity with regard to the product as compared to participants instructed to imagine the hedonic, consummatory aspects of the product and control participants engaged in a neutral task. These findings were replicated in a second study. Additionally, in Study 2 we found that automatic evaluations of chocolate were lowest for participants instructed to form implementation intentions to refrain from consumption. Taken together, these findings demonstrate that mental self-control strategies such as nonconsummatory transformation and implementation intentions extend to the level of automatic processing by reducing the positivity of automatically activated affective responses. Copyright © 2009 John Wiley & Sons, Ltd.

In their everyday lives, people often face the challenge of resisting tempting impulses (Baumeister & Heatherton, 1996). In order to improve their chances of resisting temptation, people employ a variety of self-control strategies (e.g., Hoch & Loewenstein, 1991; Metcalfe & Mischel, 1999; Trope & Fishbach, 2000). For instance, individuals may precommit themselves to abstinence or control before entering a tempting situation such that yielding to temptation becomes less probable. A classical epic example is the story of Ulysses and the sirens in which Ulysses ordered his seamen to plug their ears with wax and bind him to the mast, so that, no matter how luring the sirens' song, it would be impossible for him to cast himself into the sea. In modern terminology, the seamen and Ulysses engaged in drastic forms of stimulus control (i.e., avoiding the very perception of the tempting stimulus) and response control (i.e., removing the possibility of a response), respectively.

Often, however, delegating self-control to precommitment devices such as ropes or the power of others is not an option. Rather, ordinary people have to confront temptations at hand everyday by means of cognitive self-regulatory strategies targeted at stimulus or response control (Hoch & Loewenstein, 1991; Metcalfe & Mischel, 1999). For instance, the seminal research on delay of gratification suggests that cognitive transformation, a form of cognitive stimulus control, can aid self-control when there is no chance to avoid perceiving the tempting stimulus (Mischel, 1974; Mischel & Baker, 1975). Particularly, if children were instructed to cognitively focus on the nonconsummatory qualities of a delayed reward (e.g., imagining marshmallows as white puffy clouds), waiting time was greatly enhanced. In contrast, if children were

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instructed to imagine the consummatory aspects of the reward (e.g., the sweet soft taste of the marshmallows), waiting for the delayed reward became increasingly difficult (Mischel & Baker, 1975).

Another prominent mental strategy pertaining to cognitive response control is forming implementation intentions (Gollwitzer & Brandstätter, 1997). In essence, implementation intentions can be described as cognitive structures that link an appropriate goal-directed response to a suitable situation in which to perform that response. Research by Gollwitzer and colleagues suggests that implementation intentions greatly facilitate the translation of intentions into actual behavior (e.g., Gollwitzer, 1999; Gollwitzer & Brandstätter, 1997; Gollwitzer & Sheeran, 2006).

In the present research, we built on this work and investigated whether cognitive stimulus-control (i.e., nonconsummatory transformations) and/or cognitive response-control (i.e., implementation intentions) reduce the degree of automatic positivity triggered by the tempting stimulus at which they are directed. In Studies 1 and 2 we investigated the effects of nonconsummatory transformation of a tempting stimulus on its automatic evaluation. We assumed that nonconsummatory transformation of a tempting stimulus may change the automatic evaluation of the stimulus by means of changing which particular information will be triggered in memory. Related experiments in the realm of stereotypes support this general notion. For example, participants who engaged in counterstereotypic mental imagery (e.g., imagining the features of strong women) exhibited reduced scores on an Implicit Association Test of gender stereotyping (Blair, Ma, & Lenton, 2001). Applied to automatic attitudes toward tempting stimuli, we expected that nonconsummatory mental transformation of a chocolate stimulus to decrease its automatic positivity, relative to a neutral comparison group and a group instructed to imagine its consummatory aspects.

In Study 2 we additionally investigated the effects of implementation intentions on automatic evaluations of tempting stimuli. The effectiveness of implementation intentions on self-regulatory goal pursuit is well documented (e.g., Achtziger, Gollwitzer, & Sheeran, 2008; Gollwitzer & Sheeran, 2006). There is also increasing evidence about the automatic nature by which implementation intentions produce their effects (e.g., Bayer, Achtziger, Gollwitzer, & Moskowitz, 2009; Webb & Sheeran, 2007). However, there is still scant research on the relation between implementation intentions and automatic associations with regard to the objects toward which implementation intentions may be directed. Recent work by Stewart and Payne (2008) in the domain of stereotyping showed that implementation intentions to think “safe” upon appearance of a Black face in the weapon identification paradigm (Payne, 2001) reduced automatic stereotyping. Similar to the mental transformation work cited above, this research primarily addressed automatic stereotyping but not hedonic evaluations of tempting stimuli. Furthermore, implementation intentions in Stewart and Payne (2008) were directed specifically at improving task performance during the implicit measure itself. In the present research, we investigated in the domain of food temptation (e.g., Achtziger et al., 2008) whether more general implementation intentions to resist a temptation in an imagined everyday scenario (e.g., “If somebody offers me a piece of chocolate, I will say *no thanks!*”) can decrease the automatic evaluation of the tempting stimulus. This prediction can be derived from research suggesting that avoidance orientations are strongly related to affectively negative representations in memory and, therefore, facilitate negatively valenced evaluations and judgments (e.g., Cacioppo, Priester, & Berntson, 1993; Neumann, Förster, & Strack, 2003). Engaging in implementation intentions to resist consumption may strengthen the link between the temptation and negatively valenced avoidance behaviors, thereby effectively “cooling the heat” of temptation.

STUDY 1

Study 1 was concerned with the effects of cognitive transformation (Mischel & Baker, 1975) of an object on its automatic evaluation. The food object of interest in Study 1 was a popular German chocolate product. It is advertised as “the white temptation”—an epithet the first author confirms from experience is aptly chosen. The chocolate has a spherical shape and can be described as a delicious composition of almonds and smooth milk creme surrounded by a crispy waffle and a fine white coconut coating.

Method

Participants

Participants were 71 undergraduate students (79% female) with a mean age of 23.83 years ($SD = 5.61$) from the University of Landau, who participated in exchange for € 5.

Materials and procedure

Upon arrival, participants were greeted by an experimenter and seated at separate cubicles. Initially, participants were shown an exemplar of the chocolate product to ensure that they were familiar with the object under study.

Cognitive Transformation manipulation Participants were assigned randomly to the consummatory ($N = 23$), the nonconsummatory transformation ($N = 26$), or the control condition ($N = 22$). Three minutes were given to participants in each condition to perform the experimental tasks. In the consummatory condition, participants were asked to focus on the sensory aspects of consuming the chocolate product. They were asked to imagine as clearly and concretely as possible how eating the chocolate would taste and feel. In the nonconsummatory transformation condition, participants were asked to imagine the chocolate in a strange and extraordinary way in a context unrelated to consumption (Mischel & Baker, 1975). Specifically, participants were asked to imagine as clearly and concretely as possible odd or novel settings or uses for the chocolate. In both of these conditions, an example was given in order to illustrate the task. Participants in the first two conditions were instructed to jot down on a sheet of paper each imagination as it occurred. Two independent coders later coded the number of distinct consummatory or nonconsummatory imaginations from participants' notes (interrater $r = .90$). In the control condition, participants were instructed to read a neutral text about a geographic location in South America that did not contain any words related to food consumption. Immediately after the manipulation, participants completed the PANAS scale (Watson, Clark, & Tellegen, 1988), a brief mood state questionnaire measuring positive ($\alpha = .80$) and negative ($\alpha = .73$) mood states with 10 items each on a five-point rating scale.

Automatic evaluations After the manipulation, participants' automatic evaluations of the chocolate were assessed as in the study by Hofmann, Rauch, & Gawronski (2007) using a single-category Implicit Association Test (Karpinski & Steinman, 2006). We used six different pictures of the chocolate as target stimuli and three positive and three negative pictures and words each as attribute stimuli. Each of the two critical blocks consisted of 75 trials. An index of automatic evaluations was calculated according to the D-measure of Greenwald, Nosek, and Banaji (2003) which reflects the difference in reaction times between the two blocks. Increasing positive values of this index indicate faster reaction times in the block in which chocolate pictures and positive stimuli shared the same response key as compared to chocolate pictures and negative stimuli; increasing negative values indicate the reverse. A score of zero indicates no difference between the two blocks. Internal consistency ($\alpha = .82$) was determined by calculating the D-measure for four subsets of trials from an alternating split.

Finally, participants completed a measure of explicit attitudes toward the chocolate product consisting of two five-point semantic differentials. The poles were "not at all tasty" versus "very tasty" and "I do not like it at all" versus "I like it a lot." Both ratings converged to a great extent and were combined into a single explicit attitude index ($\alpha = .86$) with higher scores indicating a more positive explicit attitude. At the end of the study, participants were probed for suspicion, thanked, and debriefed.

Results

As a manipulation check, we counted the number of consummatory and nonconsummatory imaginations participants produced in the two transformation conditions. Participants in the consummatory transformation group recorded significantly more consummatory imaginations ($M = 4.77$; $SD = 2.02$) than nonconsummatory imaginations ($M = 0.13$; $SD = .63$), $t(22) = 4.43$, $p < .001$. Participants in the nonconsummatory transformation group produced more nonconsummatory imaginations ($M = 4.00$; $SD = 1.30$) than consummatory imaginations ($M = 0$; $SD = 0$), $t(25) = 15.74$, $p < .001$. Hence, the manipulation of cognitive transformations was successful. Moreover both experimental groups did not differ in positive, $F(2,68) < 1$, $p = .65$, or negative mood states, $F(2,68) < 1$, $p = .65$ (see Table 1). Furthermore, we ascertained that there were no outliers ($\pm 3 SD$) regarding automatic evaluation or the explicit attitude measure in the three groups.

As can be seen from Table 1, automatic evaluations toward the chocolate were higher for participants instructed to think about consumption of the product than for those instructed to transform the temptation in an odd or novel manner, with the control group falling in-between these two experimental conditions. Means from all three groups were in the positive range of the IAT index, indicating relative differences in the degree of positive automatic evaluation of the chocolate. An

Table 1. Means, Standard Deviations, and range of main variables by experimental condition

Variables		Consummatory transformation	Control	Nonconsummatory transformation
Automatic evaluations	<i>M</i>	0.48 _a	0.44 _a	0.29 _b
	<i>SD</i>	0.19 _a	0.24 _a	0.33 _a
	Min/Max	-0.03/0.77	-0.10/0.89	-0.80/0.72
Explicit attitudes	<i>M</i>	4.44 _a	4.25 _a	3.62 _b
	<i>SD</i>	0.87 _a	0.94 _a	1.04 _a
	Min/Max	2.50/5.00	2.00/5.00	1.00/5.00
Positive mood	<i>M</i>	3.01 _a	2.84 _a	2.90 _a
	<i>SD</i>	0.55 _a	0.59 _a	0.66 _a
	Min/Max	2.20/4.60	2.00/4.70	1.90/4.30
Negative mood	<i>M</i>	1.30 _a	1.23 _a	1.32 _a
	<i>SD</i>	0.38 _a	0.21 _a	0.37 _a
	Min/Max	1.00/2.70	1.00/2.20	1.00/1.90

Note: Min = Minimum; Max = Maximum. Row means with different subscripts differ significantly at $p < .05$.

analysis of variance on automatic evaluations yielded a significant overall condition effect, $F(2,68) = 3.70, p = .03$. Tukey-LSD *post hoc* testing of pairwise contrasts indicated that the nonconsummatory transformation group differed significantly from the consummatory, $p = .013$, as well as the control group, $p = .046$, with the latter two groups not differing significantly from each other, $p = .65$.

Regarding explicit attitudes toward the chocolate, a corresponding overall effect emerged, $F(2,68) = 4.99, p < .001$. *Post hoc* tests indicated that explicit attitudes for the nonconsummatory transformation condition were significantly lower than the consummatory, $p < .01$, and the control condition, $p = .02$. Again, explicit attitudes for the latter two groups did not differ reliably from each other, $p = .52$.

As a follow-up analysis, we correlated the number of distinct imaginations with automatic evaluations for each of the two transformation conditions. The number of imaginations was negatively related to automatic evaluations in the nonconsummatory transformation condition, $r = -.39, p = .046$, indicating that more imaginations lead to less positive automatic evaluations of the chocolate. Conversely, there was a positive but nonsignificant relationship between number of imaginations and automatic evaluations in the consummatory condition, $r = .24, p = .29$. The difference in correlation coefficients for the two groups was significant, $Z = 2.15, p = .02$. Furthermore, the number of imaginations was unrelated to explicit attitudes in both the consummatory, $r = -.09, p = .68$, and the nonconsummatory group $r = -.18, p = .39$, and here the difference in correlation coefficients was not significant, $Z = .30, p = .62$. Finally, we analyzed the relationship between automatic evaluations and explicit attitudes within each group. These correlations were low and nonsignificant in all three groups, $r_{\text{consummatory}} = .24, p = .29, r_{\text{nonconsummatory}} = .15, p = .48, r_{\text{control}} = .01, p = .96$.

Discussion

The results from Study 1 suggest that the cognitive transformation of a tempting stimulus can influence the degree of automatic evaluation elicited by this stimulus. Specifically, participants instructed to think about nonconsummatory, uncommon aspects of a chocolate product exhibited less automatic positivity toward the chocolate as assessed with a single-category IAT than participants in the control condition or participants instructed to think about the consummatory aspects of the chocolate. The findings cannot be explained in terms of general mood effects because the experimental groups did not differ in their positive and negative affective states.

The findings are further strengthened by a differential relationship between the number of imaginations engaged in each transformation group and automatic evaluations, with more imaginations related to less positive automatic evaluations in the nonconsummatory transformation condition and to more positive automatic evaluations in the consummatory transformation condition. This supporting correlational evidence held only with regard to automatic associations but not

with regard to explicit attitudes, indicating that only automatic evaluations were influenced linearly by the number of evaluative information connected to the attitude object (see also Rydell & McConnell, 2006).

Next to automatic evaluations, explicit attitudes varied systematically as a function of how participants appraised the attitude object. Interestingly, however, implicit and explicit attitudes were uncorrelated within conditions. We will address this issue in the general discussion.

STUDY 2

Study 2 was geared toward replicating and extending the general findings from Study 1. First, given that the exact temptation one will face cannot always be determined in advance, it is important to investigate whether cognitive transformation also works with the superordinate category of chocolate without any reference to specific brands. Second, Study 2 also investigated the effects of cognitive response control in the form of implementation intentions to refrain from consumption. This allowed comparison of the relative efficiency of stimulus related (i.e., nonconsummatory transformation) and response related (i.e., implementation intentions) mental self-control strategies for the same attitude object.

Study 2 was conducted on the Internet via the Project Implicit website (<https://implicit.harvard.edu/>; see Nosek et al., 2007, for detailed reports on the virtual laboratory). Participants were recruited between 22 June and 31 July 2007 through the large study pool from the Project Implicit website. Registration procedures assured that no participant was assigned twice to the present study.

Method

Participants

A total of 506 participants (average age = 35.55, $SD = 11.50$; 70.9% female) completed the study. Participants completed the study out of interest in feedback about their implicit attitudes.

Materials and procedure

Mental self-control manipulations After registration at the Project Implicit website and random assignment to the current study, participants were randomly assigned to one of five conditions. As in Study 1, participants in the consummatory transformation condition ($N = 110$) were instructed to imagine consuming the chocolate as vividly and concretely as possible by concentrating on the accompanying sensory experiences. Participants in the nonconsummatory transformation condition ($N = 128$) were instructed to imagine the chocolate in a strange or novel way unrelated to the purpose of consumption (Mischel & Baker, 1975). In the implementation intentions condition ($N = 128$), participants were asked to

... imagine that you have the goal of not eating chocolate. Therefore you are motivated to resist chocolate in situations in which it is being offered to you or otherwise available. We would like you to visualize such “tempting” situations and to form a clear intention on how to avoid eating the chocolate in these particular situations. For instance, you may envision yourself in a cinema sitting next to a friend who is eating chocolate and offers you some of it during the film. In this case you may say to yourself: “If my friend offers me chocolate during the film, I will say ‘no thanks’ and concentrate on the film.”

For every situation you imagine, we would also ask you to write down on a piece of paper your intention to refuse in the form specified above (“If ..., I will ...”) and to repeat the intention silently to yourself.

Because Study 2 was Internet-based, written descriptions of imaginations were not collected. In the control condition ($N = 140$), participants were asked to come up with city names in alphabetic order from A to Z (e.g., Atlanta, Boston, Chicago, etc.) at their own pace. Two minutes were allotted for each of the five conditions.

Automatic evaluations Next, participants completed an IAT with chocolate as the primary target category of interest and furniture as a neutral reference category (e.g., Blanton, Jaccard, Gonzales, & Christie, 2006). Four pictures of chocolate (no specific brand visible) and furniture were used as target stimuli. As attribute stimuli we used four pictures of positive and negative valence, respectively, taken from the International Affective Picture System (Lang, Bradley, & Cuthbert, 2005). There were a total of 20 practice and 40 test trials for each combined block of the task. Order of combined block assignment and key assignment for the pleasant key (left or right) were balanced across participants. IAT data from 14 participants (2.8%) were removed because of overall error rates exceeding 20% of responses. IAT D scores were coded such that higher scores indicate a more positive automatic evaluation of the chocolate. The internal consistency of the IAT was good ($\alpha = .86$).

Explicit attitudes Following the IAT, participants indicated their explicit attitudes toward chocolate. The same two items as in Study 1 were employed in order to assess explicit attitudes toward chocolate except that seven-point rating scales were used ($\alpha = .87$). Three participants did not provide data on the explicit measure.

Results

An ANOVA of automatic evaluations with condition, compatibility order, and key assignment as between-participants factors yielded a significant main effect of condition, $F(3, 476) = 13.38, p < .001$, indicating that automatic evaluations varied as a function of experimental conditions. Second and in line with previous research (Greenwald, McGhee, & Schwartz, 1998; Lane, Banaji, Nosek, & Greenwald, 2007), IAT scores were higher on average for participants performing the compatible block (chocolate—pleasant) first rather than second, $F(1, 476) = 174.86, p < .001$. Importantly, compatibility order did not interact with experimental condition $F(3, 476) < 1, p = .42$. Neither were there any other reliable higher-order interactions among the three factors. Figure 1 provides the mean automatic evaluations for each group, collapsed across procedural factors. *Post hoc* contrast testing indicated that all four groups differed significantly from each other ($p < .05$), with automatic evaluations being highest in the consummatory transformation condition, and lowest in the implementation intentions condition with the control and the nonconsummatory transformation conditions in-between (see Figure 1).

We also conducted an ANOVA with explicit attitudes as dependent variable and condition as a factor. A significant main effect of condition emerged, $F(3, 476) = 3.34, p = .02$. *Post hoc* tests indicated that the consummatory ($M = 4.71; SD = 1.66$), the control ($M = 4.95; SD = 1.68$), and the nonconsummatory transformation group ($M = 4.79; SD = 1.60$) did not differ significantly from each other; however, the latter two groups differed significantly from the implementation intentions group ($M = 4.28; SD = 1.88$). Finally, we inspected the pattern of implicit–explicit correlations across conditions. The relationship was significant in the nonconsummatory transformation condition, $r = .21, p = .02$, and not significant in all other conditions, $r_{\text{consummatory}} = .18, p = .06, r_{\text{implementation}} = .11, p = .23, r_{\text{control}} = .03, p = .76$.

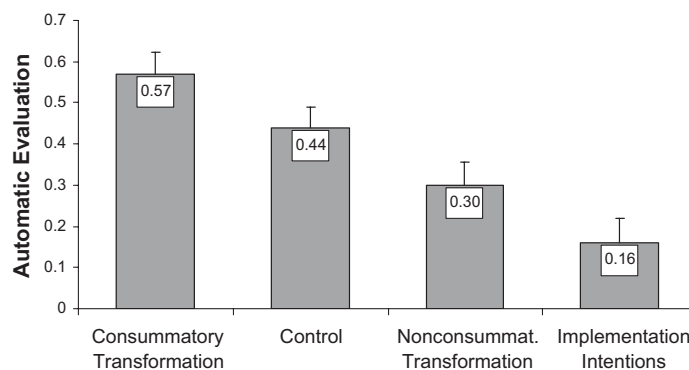


Figure 1. Effects of experimental condition on the automatic evaluation of chocolate as assessed with an Implicit Association Test (Greenwald et al., 1998). Error bars indicate standard errors.

Discussion

The findings from Study 2 corroborate and extend the main findings from Study 1. Employing the superordinate category of chocolate as the attitude object of interest, we again found that participants who cognitively transformed the object of interest displayed less automatic positivity toward chocolate in a subsequent IAT as compared to participants asked to think about the consummatory aspects or participants engaged in a control task. Interestingly, the largest reduction in the automatic positivity toward chocolate was obtained in the implementation intentions condition. This finding suggests that implementation intentions can be successfully employed to reduce the degree of automatic positivity elicited by a temptation.

In contrast to Study 1, the consummatory group in Study 2 displayed significantly more positive automatic evaluations toward the chocolate than the control group. We believe that the fact that the temptation of interest had been presented *in vivo* to participants before they engaged in the experimental conditions in Study 1 may have activated consummatory concepts in all participants to a certain degree, including the control group. As a consequence, decrements in automatic evaluations in the nonconsummatory condition may have been more easily detectable than increments in automatic evaluations in the consummatory condition.

GENERAL DISCUSSION

In one laboratory and one web-based laboratory, we found that participants instructed to imagine a tempting food stimulus (chocolate) in nonconsummatory ways exhibited reduced positive automatic evaluations toward the chocolate than control participants and participants instructed to focus on consummatory aspects. These findings are the first to show a link between stimulus-oriented mental self-control as researched by Mischel and Baker (1975) and automatic evaluative processes supposed to underlie appetitive, impulsive behaviors (Hofmann, Friese, & Strack, 2009; Metcalfe & Mischel, 1999). In addition, Study 2 demonstrated that implementation intentions to resist a temptation were highly successful at reducing the automatic positivity elicited by the tempting stimulus. These findings are among the first to suggest that implementation intentions may not only be harnessed to strengthen the initiation (e.g., Gollwitzer & Sheeran, 2006) or shielding (e.g., Achtziger et al., 2008) of one's goal strivings but also to weaken the power of the temptation at hand in the first place. This interpretation accords well with recent research from the stereotyping domain (Stewart & Payne, 2008) in which implementation intentions to think "safe" whenever perceiving a black face in the weapon identification paradigm (Payne, 2001) have been shown to reduce the negative stereotypic bias as measured by this task. The present findings go beyond these results, however, by showing implementation intention effects on the automatic hedonic processing of rewarding stimuli and by establishing these effects for self-chosen implementation intentions containing everyday behaviors (rather than for specific instructions on how to react during an implicit measurement procedure; Stewart and Payne, 2008). The present effects are encouraging by suggesting that implementation intentions may not only reduce overlearned stereotypic responses (Stewart & Payne, 2008) but even "tame" consummatory processes relating to fundamental biological needs such as eating behavior for which highly specialized reward systems have been identified (e.g., Berridge, 1996).

Viewed in concert, the present studies offer new insights into why certain mental self-control strategies may be useful in fighting temptation: By influencing not only conscious attitudes but also automatic stimulus evaluation, a given temptation may lose its hedonic appeal to the organism. As a consequence, the temptation may exert less influence on self-regulatory behavior via impulsive, automatic pathways of behavior determination (e.g., Hofmann, Gschwendner, Friese, Wiers, & Schmitt, 2008; Strack & Deutsch, 2004; for a review, see Hofmann, Friese, & Strack, 2009).

Interestingly, not only automatic evaluations but also explicit attitudes changed as a function of experimental condition. However, the low correlations between automatic evaluations and explicit attitudes suggest that neither did automatic evaluations mediate treatment effects on explicit attitudes nor the other way around. Rather, these low correlations indicate that the processes leading to changes in automatic evaluations as a function of experimental treatment were fundamentally different from the processes leading to explicit attitude change (see case 5 in Gawronski & Bodenhausen, 2006).

One limitation of the present research is that only short-term effects were studied. Future research should investigate the potential long-term effects of mental self-control strategies as well as their effectiveness in high-risk situations such as

when a temptation is encountered under conditions of low cognitive resources. By mapping the range of these and other mental strategies on automatic and controlled information processing, additional insights into how mental resistance to temptation is possible will be obtained.

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