



# The memory-search frame effect: impacts on consumers' retrieval and evaluation of consumption experiences

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## Abstract

When consumers recall past consumption experiences (e.g., vacations), they often need to search their memory for relevant events within certain time frames (e.g., the past year). We refer to the time frames as *memory-search frames*. We provide evidence of the ecological validity of this construct and study its effects on consumers' construction of events from memory. We propose that memory-search frames can affect consumers' estimation of time via their effects on the retrieval and evaluation of events from memory. Specifically, we show that adopting longer (versus shorter) memory-search frames leads consumers to retrieve experiences that are objectively more distant in the past but at the same time makes them perceive the experiences to be subjectively closer. We demonstrate the implications of the current effect for consumers' judgment and preference. In addition, we show that memory-search frame length tends to increase with age, which in part underlies the perceptions of accelerated time by old people. Theoretical and practical implications of the present research are discussed.

**Keywords** Memory · Reference frame · Temporal distance · Age

## 1 Introduction

The study of memory has long attracted the attention of marketing researchers because of the influences that consumers' memory has on their decisions and behaviors (Morwitz 1997; Zauberma et al., 2009a, b). In this paper, we study a novel construct that has rich implications for this stream of research. When consumers recall past consumption experiences, it is often necessary that they search

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their memory for relevant events (Yntema & Trask, 1963). Most of those searches in memory are tacitly bounded by certain time frames (e.g., the past year), which we refer to as *memory-search frames*. We argue that memory-search frames can have potentially diverse impacts on consumers' construction of experiences from memory. In the current research, we focus on the temporal dimension of recalled experiences because it has important implications for consumers' judgment and preference (Prelec & Loewenstein, 1997; Soman et al., 2005). In addition, we examine the implications of the current construct for the effect of age on time perception. In the following sections, we elaborate our conceptualization and present three studies that provide support to our propositions.

## 2 Conceptual framework

### 2.1 Memory-search frame

People's recall of their past experiences usually involves effortful search processes in memory (Hasher & Zacks, 1979; Yntema & Trask, 1963). For example, consider consumers who are asked to recall a good dining experience so as to suggest a place for dinner tonight. In coming up with their suggestions, some would probably search their memory for dining experiences in the past month, while others may search their memory for dining experiences in the past year. We refer to these different time frames within which consumers search for relevant events in memory as *memory-search frames*.

We argue that in most cases, the length of memory-search frames is non-specific and implicit in nature. For instance, it is unlikely that a consumer would consciously or explicitly confine her search for relevant consumption experiences to exactly the recent 30 days. Nevertheless, characteristics of the focal event and certain individual differences could influence the length of memory-search frames that consumers adopt when they recall past consumption experiences. We believe that previous research has largely overlooked the construct of memory-search frame and its implications for consumer behavior because of its non-specific and implicit nature.

### 2.2 Effects of memory-search frame on temporal distance

The literature has identified many cues that consumers use in their estimation of temporal distance. Most of these cues pertain to characteristics of the recalled event, including the event's emotional intensity (Van Boven et al., 2010), implication for self-image (May & Irmak, 2014), recurrence likelihood (Si et al., 2016), and relevance with other events (Zauberman et al., 2010). Other factors, such as those pertinent to the process of retrieval and evaluation of events from memory, are also likely to affect consumers' temporal distance judgment and have influences on their

downstream behaviors. The impacts of these factors could be potentially profound. However, as far as we know, relatively little has been done to study the effects of memory process factors on temporal judgment and consumer behavior.

We address this gap in the current research. We propose that memory-search frames can differentially affect the objective and subjective temporal distance of recalled consumption experiences via their impacts on the retrieval and evaluation of events from memory. First, we propose that adopting longer memory-search frames leads consumers to recall events that occurred in the more distant past. This is because as consumers search in a longer time frame, more relevant events in the distant past are included in their search, and it becomes more likely that objectively distant events are retrieved from memory.

Second, we propose that given the retrieved events, adopting longer memory-search frames causes consumers to perceive the events to be subjectively *closer*. We argue that when consumers retrieve events from memory, the length of the memory-search frames they adopt, though non-specific and implicit, serves as a referent yardstick against which their perceptions of time are constructed. Specifically, subjective judgment of temporal distance is often made in contrast to the length of reference frames (Parducci, 1965). For example, consumers judge the same time interval to be relatively shorter (longer) when they adopt a longer (shorter) reference frame (e.g., Dai and Fishbach, 2014; Monga and Bagchi, 2012). Therefore, we propose that though adopting longer memory-search frames leads consumers to retrieve consumption experiences that are objectively more distant in the past, it at the same time causes the subjective temporal distance of the recalled experiences to appear shorter.

Consistent with our proposition that memory-search frames could serve as reference yardsticks in subjective time construction, the literature has shown that consumers are often susceptible to context-appropriate time intervals in their judgment and decision-making. For example, time frames that are formed by temporal landmarks (e.g., the start of a new year) have been shown to affect people's perceptions of time (Peetz & Wilson, 2013) and influence their motivation for task initiation and goal pursuit (Dai et al., 2014; Tu & Soman, 2014). Moreover, much research has suggested that consumers' value judgments are susceptible to influences of various time frames (Kahneman & Tversky, 1984; Leclerc et al., 1995).

Nevertheless, alternative mechanisms might also explain the proposed relationship between memory-search frame and subjective temporal distance of recalled events. For example, different memory-search frames may lead consumers to recall events that differ on several other parameters which could affect their temporal judgment. One plausible account is that adopting longer memory-search frames may cause consumers to recall experiences that are higher in memory vividness because the retrieved events are selected from a larger sample. Since consumers may infer that past events with more vivid memories are more recent (Brown et al., 1985; Hinrichs, 1970), longer memory-search frames may lead to shortened perceptions of time via increased memory vividness of the retrieved events.

## 2.3 Age and memory-search frame

In the current research, we examine one individual difference that could affect memory-search frame length. We argue that older people have more experiences that might be considered relevant when they recall an event. As a result, they tend to adopt longer memory-search frames than younger people do.

Moreover, we argue that the proposed relationship between age and memory-search frame length may provide some new insight into the effect of age on time perception. Past research has documented a positive association between age and perceptions of accelerated time (Fraisse, 1963; Nitardy, 1943; Wittmann & Lehnhoff, 2005). Several accounts have been raised to explain this effect, yet conclusive evidence remains elusive (Block et al., 1998). We propose that the shortened perceptions of time could be due to older people adopting longer memory-search frames when they construct subjective time for past events. We examine the validity of this proposition in the current studies.

## 3 Study overview

We test our propositions in three studies. In study 1 and study 2, we experimentally manipulate participants' memory-search frame and examine its causal effects on the objective and subjective temporal distance of recalled experiences. In study 2, we further investigate how the current effect influences participants' judgment and preference. In study 3, we examine the relationship between age and memory-search frame length and its implications for aging effect on time perception. In this study, we also address the role of memory vividness in the current effect.

Our propositions suggest that memory-search frame has opposing effects on the objective and subjective temporal distance of recalled events. Since objective time can positively (and strongly) affect the perceived temporal distance of past events (e.g., Van Boven et al., 2010), when examining the negative effect of memory-search frame on subjective time, it is important that we disentangle it from memory-search frame's *positive indirect effect* on subjective time via the events' objective temporal distance (MacKinnon et al., 2000). Therefore, in our studies, we controlled for the effect of objective time in analyses that pertained to subjective time.

We adopted relatively large sample sizes (at least 100 participants per cell) in conducting the current studies to ensure adequate power. Data and detailed materials of our studies are available via <https://osf.io/ctbkz/>.

## 4 Study 1

### 4.1 Method

Three hundred two participants ( $M_{\text{age}} = 34.95$ ,  $SD_{\text{age}} = 12.51$ ; 123 males) were recruited from Amazon's Mechanical Turk (MTurk). We restricted our recruitment

on MTurk to people who reside in the USA. The study has two between-participant conditions (*long frame* versus *short frame*) and consists of two ostensibly independent tasks. In the first task, participants were provided a list of ten news events and were asked to select three events that they thought were the most and the least important, respectively. Those in the *long frame* condition processed news events that occurred during the past 20 years and those in the *short frame* condition processed news events that occurred during the past year. We assumed that the relative scope of the time span within which participants processed information in this task would carry over and influence the memory-search frame they adopt in the next task (Wyer et al., 2012).

In the second task, all participants freely recalled a past vacation and indicated their perceived temporal distance of the vacation. Specifically, they read that past experiences may feel quite close or far away, regardless of how long ago they actually occurred. They then indicated how far away that vacation feels to them along two 9-point items (1: feels like yesterday/feels very close, 9: feels very far away/feels very distant; adopted from Ross and Wilson (2002)). Their answers to these two items were combined to form a single measure of the vacation's subjective temporal distance ( $r = .87$ ). They also reported the vacation's objective temporal distance by indicating the year in which it occurred. We measured participants' memory-search frame length by asking them to indicate the number of years they had searched in their memory for the vacation. Finally, as in other studies, participants provided their demographic information.

## 4.2 Results

The objective temporal distance of the recalled vacation by eight participants fell out three standard deviations from their respective condition means. Data of these participants were excluded from our analyses (for similar procedure, see, e.g., Campbell and Warren (2015) and Mandel and Johnson (2002)). Including these data did not change the pattern of our findings.

Participants in the long frame condition on average adopted significantly longer memory-search frames ( $M = 6.30$  years,  $SD = 6.83$ ) than those in the short frame condition did ( $M = 3.94$  years,  $SD = 4.42$ ),  $F(1, 292) = 12.26$ ,  $p = .001$ ,  $d = .41$ , 95% confidence interval (CI) [1.03, 3.68]. The average objective temporal distance of the recalled vacations was significantly greater in the long frame condition ( $M = 4.36$  years,  $SD = 5.01$ ) than in the short frame condition ( $M = 2.92$  years,  $SD = 3.70$ ),  $F(1, 292) = 7.82$ ,  $p = .005$ ,  $d = .33$ , 95% CI [0.43, 2.45]. We analyzed the subjective temporal distance of the recalled vacations as a function of memory-search frame length (long versus short) and the objective temporal distance of the vacations. The results indicate that participants in the long frame condition perceived the vacations to be significantly *more recent* (raw mean:  $M = 5.02$ ,  $SD = 2.40$ ) than those in the short frame condition did (raw mean:  $M = 5.46$ ,  $SD = 2.17$ ),  $F(1, 291) = 4.57$ ,  $p = .033$ . Please refer to the [Appendix](#) for additional information and results of the current studies.

### 4.3 Discussion

We manipulated participants' memory-search frames and demonstrate the causal impacts of the construct on the objective and subjective temporal distance of recalled experiences. However, there are some potential confounding factors in the current manipulation. For example, the perception of a time range might be more salient in the long frame condition than in the short frame condition (see the [Appendix](#)). To address these concerns and the external validity of our findings, we use an alternative manipulation in study 2. Furthermore, in study 2, we also examine the implications of the current effects for consumers' judgment and preference.

## 5 Study 2

### 5.1 Method

One hundred and ninety-eight participants ( $M_{\text{age}} = 32.41$ ,  $SD_{\text{age}} = 9.25$ ; 125 males) from MTurk took part in this study. The study has two between-participants conditions (*long frame* versus *short frame*) and consists of two parts. In the first part, participants were asked to recall and list four sports activities that they had done in the past. Those in the *long frame* condition listed their sports activities in the past 2 years, and those in the *short frame* condition listed their sports activities in the past month.

In the second part, participants freely recalled a past dining experience at an ethnic restaurant and indicated the subjective temporal distance of that experience using the same items in study 1 ( $r = .90$ ). Next, they indicated the extent to which they missed having that particular type of food and to which they missed dining in that particular restaurant along scales from 1 (not at all) to 9 (very much). Their answers to the two items were combined to form a single measure of their desire for the dining experience ( $r = .72$ ). Participants also indicated their liking of the type of food and of the restaurant along the same scales. Their answers to the two items were combined to form a single measure of their liking of the dining experience ( $r = .61$ ). Since people's affective attitudes are relatively stable and immune to factors affecting their preference construction (Lee et al., 2009), we controlled for the heterogeneity of food types and restaurants in participants' recalls using their liking of the experience. Finally, participants indicated the objective temporal distance of the dining by reporting the number of days that had passed since that experience. We did not measure participants' memory-search frame length in this study.

### 5.2 Results

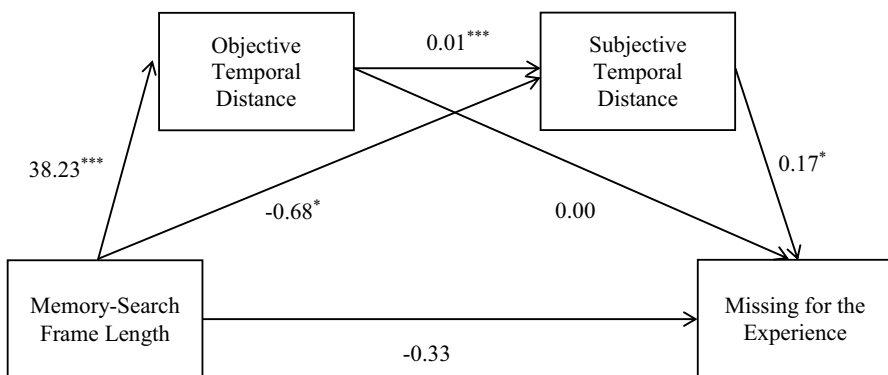
The objective temporal distance of the recalled dining experience by six participants fell out three standard deviations from their respective condition means. Data of these participants were excluded from our analyses. Again, including these data did not change the pattern of our findings.

The average objective temporal distance of the recalled experiences was greater in the long frame condition ( $M = 61.22$  days,  $SD = 92.60$ ) than in the short frame condition ( $M = 22.66$  days,  $SD = 33.08$ ),  $F(1, 190) = 15.00$ ,  $p < .001$ ,  $d = .55$ , 95% CI [18.92, 58.20]. Analysis of the subjective temporal distance of the recalled experiences as a function of participants' condition and the experiences' objective time reveals that participants in the long frame condition perceived the experiences to be significantly more recent (raw mean:  $M = 4.32$ ,  $SD = 1.83$ ) than those in the short frame condition did (raw mean:  $M = 4.71$ ,  $SD = 2.10$ ),  $F(1, 189) = 5.57$ ,  $p = .019$ . Participants' liking of the dining experiences did not differ between the two conditions,  $F < 1$ .

We constructed a path model (see Fig. 1) to examine the different effects of the experiences' objective and subjective temporal distance on participants' missing for the experiences, with their liking of the experiences included as a covariate in the model. Using 10,000 bootstrap samples (Hayes, 2013), we identify a small and positive indirect effect of memory-search frame length on missing via its sequential effect on the experiences' objective and subjective temporal distance,  $b = .05$ , boot  $SE = .03$ , 95% bias-corrected CI [0.0078, 0.1453]. More importantly, the results of our analysis reveal that there was a larger, negative indirect effect of memory-search frame length on missing via the experiences' subjective temporal distance,  $b = -.12$ , boot  $SE = .08$ , 95% bias-corrected CI [-0.3110, -0.0095]. The results indicate that the increased subjective perceptions of time led participants in the short frame condition to miss the dining experiences to a greater extent even though their recalled experiences occurred in the relatively more recent past.

### 5.3 Discussion

We replicated our previous findings using a different manipulation of memory-search frames. Moreover, our results demonstrate the current effect's influences on consumers' judgment and preference construction. Specifically, we collected data for two additional baseline conditions ( $n = 202$ ; see the [Appendix](#) for more information)



**Figure 1** Path model in study 2. Note. Participants' liking of the recalled dining experiences was included as a covariate in the model.  $^{***} p < .001$ ,  $^{**} p < .01$ ,  $^* p < .05$

in which we asked participants to recall a dining experience that occurred either in the relatively recent past or in the relatively distant past. Consistent with previous findings (e.g., Dai and Fishbach, 2014), the results indicate that participants in the distant past condition missed the experiences more than those in the recent past condition did. In contrast, participants in the experimental conditions (as reported here) exhibited stronger desires for experiences that occurred in the relatively more recent past. The results suggest that consumers' preferences follow more closely with their subjective perceptions of time when these perceptions change in divergent directions as compared to objective time.

Our studies so far, however, have not addressed the role of memory vividness in the current effect. Since events retrieved from a larger sample in memory are likely to be more vivid, longer memory-search frames may influence the subjective temporal distance of recalled events via increased memory vividness. We examine this proposition in study 3.

## 6 Study 3

Study 3 is a correlational study that adds further evidence of the ecological validity of memory-search frame by examining its natural variation in the population. Specifically, we study age as an individual difference that affects memory-search frame length. We further examine whether differences in memory-search frame length underlie the effect of age on time perception. Finally, we address the role of memory vividness in the current effect by measuring it and controlling for its impacts on subjective time.

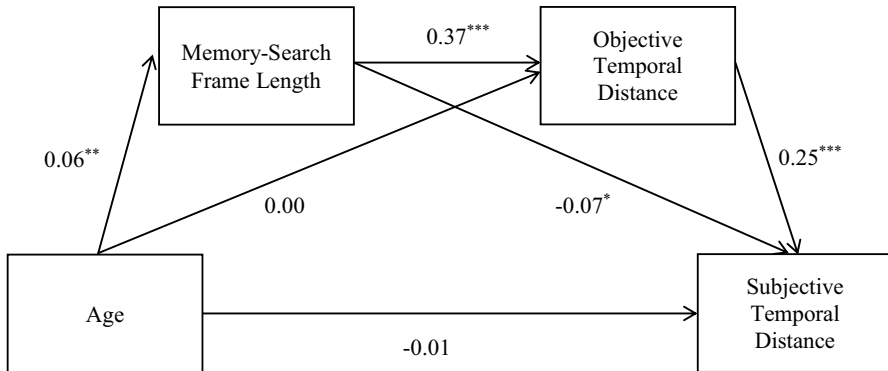
### 6.1 Method

Three hundred two participants ( $M_{age} = 33.98$ ,  $SD_{age} = 11.12$ ; 177 males) were recruited from MTurk. They freely recalled a memorable vacation in the past and indicated their perceived temporal distance of that vacation using the same two items in the previous studies ( $r = .86$ ). They also indicated the number of years that had passed since the vacation. In addition, participants reported their memory vividness of the recalled vacation by indicating how easy, vivid, and frequent their recall of the vacation was along 9-point scales. Their answers to the three items were averaged to form a single measure of memory vividness ( $\alpha = .73$ ). Finally, participants reported their memory-search frame length using a similar item as that in study 1.

### 6.2 Results

The objective temporal distance of the recalled vacation by nine participants fell out three standard deviations from the sample mean. Data of these participants were excluded from our analyses. Again, including these data did not change the pattern of our findings. Participants' age ranged between 18 and 73 years. On average, they recalled vacations that were 2.27 years ago ( $SD = 2.35$ ) and searched in time frames





**Figure 2** Path model in study 3. Note. Participants' memory vividness of the recalled vacations was included as a covariate in the model. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$

of 4.58 years ( $SD = 4.01$ ) in their memory. Participants' age and the memory vividness of their recalled vacations were positively correlated,  $r = .18$ ,  $p = .002$ .

We examined the effects of age on participants' memory-search frames and their estimations of time by constructing the path model as shown in Fig. 2. Participants' memory vividness of the vacations was included as a covariate in the model. Consistent with our proposition, the coefficient of the effect of age on memory-search frame length was positive,  $b = .06$ ,  $t = 2.84$ ,  $p = .005$ , indicating that older people tend to adopt relatively longer memory-search frames. In line with our previous findings, memory-search frame had a positive effect on the recalled vacations' objective temporal distance,  $b = .37$ ,  $t = 13.96$ ,  $p < .001$ , whereas it had a negative effect on the vacations' subjective temporal distance,  $b = -.07$ ,  $t = 2.03$ ,  $p = .043$ . The results of a bootstrapping analysis with 10,000 bootstrap samples show that participants' age had a negative indirect effect on the vacations' subjective temporal distance via memory-search frame length,  $b = -.004$ , boot  $SE = .003$ , 95% bias-corrected CI  $[-0.0117, -0.0002]$ . The results thus suggest that increases in older people's memory-search frame length can partially account for their perceptions of accelerated time.

### 6.3 Discussion

The results of the current study indicate that age is an individual difference that affects memory-search frame length. Our results further suggest that variation in memory-search frame length could partially account for the effect of age on time perception. Moreover, we reexamined data of study 1 and study 2 (in which we experimentally manipulated participants' memory-search frames) and found consistent patterns of results regarding age<sup>1</sup>. Finally, we obtained our results while

<sup>1</sup> The correlation between age and memory-search frame length was 0.173 ( $p = .003$ ) in study 1. The correlation between age and the recalled events' subjective temporal distance, controlling for their objective temporal distance, was  $-0.081$  ( $p = .166$ ) in study 1 and was  $-0.137$  ( $p = .059$ ) in study 2.

controlling for the effects of memory vividness, which suggests that vividness was unlikely to be the key factor driving the current effect.

## 7 General discussion

We identify a new construct—memory-search frame—and study its effects on consumers' construction of experiences from memory. We focus on the temporal dimension and show that adopting longer (versus shorter) memory-search frames leads consumers to recall experiences that are objectively more distant in the past but at the same time perceive the experiences to be subjectively closer. In addition, we show that older people tend to adopt longer memory-search frames than younger people do and this difference can in part contribute to the phenomenon that time appears to pass more quickly as people age.

### 7.1 Theoretical contributions

As we discussed earlier, consumer research has focused on studying memory cues that pertain to the characteristics of the recalled event. Relatively little is known about factors that influence consumers' retrieval and evaluation of events from their memory in the first place. Our research highlights an under-studied construct in this process and investigates its effects on time construction and consumer behavior. Moreover, our findings provide new insight into the effect of age on time perception. Different from extant perspectives (Block et al., 1998; Fraisse, 1963), we argue that the mechanism underlying the phenomenon could be essentially independent of age.

Our research also contributes to better understanding of the relationship between the objective and subjective temporal distance of past events and their differential impacts on consumer behavior. The literature has suggested that consumers' subjective time perceptions may not always map onto objective time and that this distinction could have important implications. For example, Zauberman et al. (2009a, b) showed that hyperbolic discounting of future rewards with respect to objective time could be accounted for by models of constant discounting with respect to subjective time. However, previous research has not done enough as to suggest which type of distance is more essential in driving consumers' preferences. In the current studies, we were able to decouple the directions of change of objective and subjective time and thus present clearer evidence that consumers' subjective time perceptions play a more critical role in the effects of time on judgment and preference.

### 7.2 Marketing implications, limitations, and future research

The present research has important implications for marketing practitioners and consumers alike. When consumers are contemplating for hedonic experiences, they often implicitly ask when their last consumption was. Studies have shown that

consumers' responses to such questions can critically influence their preferences and decisions (Dai & Fishbach, 2014; May & Irmak, 2014). The results of our study 2 indicate that adopting shorter memory-search frames can make consumers perceive their past consumption experiences to be subjectively more distant and thereby increases their desire for repeated patronage. Therefore, the memory-search frame effect could have substantial downstream implications for customer loyalty and consumer well-being. It is important that both marketers and policy makers attend to this subtlety in designing their promotion programs. The current studies have shown how we can manipulate consumers' memory-search frames, and we hope that similar tactics can be implemented in the field.

A major limitation of our research, however, is that it has focused relatively less on investigating the mechanisms of the memory-search frame effect. Though we have controlled for the effects of memory vividness in study 3, future research should continue to examine the impacts of vividness and other factors in the current effect, since adopting longer memory-search frames is likely to elicit recall of events that vary on multiple dimensions. For example, different memory-search frames may lead consumers to recall consumption experiences that differ in emotionality, typicality, or memory efficacy (Touré-Tillery and Kouchaki 2021). We call on future studies to investigate the broader implications of the memory-search frame effect for consumer behavior.

More research is also needed to understand the deeper processes and dynamics that underpin the memory-search frame effect. For instance, in an unreported study, we did not observe the current effect when the memory-search frame manipulation was implemented after participants' recall of a past event. The results therefore suggest that the memory-search frame effect unfolds during the retrieval process in memory and that reference frames that are later or externally provided are less able to influence people's time construction. Alternatively, the results may suggest that the current effect is driven by factors we discussed above such that it disappears when those elements are fixed. We believe that investigations into these issues constitute a meaningful avenue of future research.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s11002-021-09603-6>.

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